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TEXAS AGRICULTURAL EXPERIMENT STATION

B. YOUNGBLOOD, Director
COLLEGE STATION, BRAZOS COUNTY, TEXAS

THIRTY-EIGHTH ANNUAL REPORT
1925

MYCOLOGY

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS
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———, *Chief*

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W. H. WOOD, *Feed Inspector*
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No. 2, Troup, Smith County:
W. S. HOTCHKISS, *Superintendent*

No. 3, Angleton, Brazoria County:
V. E. HAFNER, B. S., *Superintendent*

No. 4, Beaumont, Jefferson County:
R. H. WYCHE, B. S., *Superintendent*

No. 5, Temple, Bell County:
H. E. REA, B. S., *Superintendent*

No. 6, Denton, Denton County:
P. B. DUNKLE, B. S., *Superintendent*

No. 7, Spur, Dickens County:
R. E. DICKSON, B. S., *Superintendent*

No. 8, Lubbock, Lubbock County:
D. L. JONES, *Superintendent*
FRANK GAINES, *Irrigationist and Forest Nurseryman*

No. 9, Balmorhea, Reeves County:
J. J. BAYLES, B. S., *Superintendent*

No. 10, Feeding and Breeding Station, near College Station, Brazos County
R. M. SHERWOOD, M. S., *Animal Husbandman in Charge of Farm*
L. J. McCALL, *Farm Superintendent*

No. 11, Nacogdoches, Nacogdoches County:
H. F. MORRIS, M. S., *Superintendent*

No. 12, Chillicothe, Hardeman County:
J. R. QUINBY, B. S., *Superintendent*
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No. 14, Sonora, Sutton-Edwards Counties:
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V. L. CORY, M. S., *Grazing Research Botainst*
**O. G. BABCOCK, B. S., *Collaborating Entomologist*
O. L. CARPENTER. *Shepherd*

No. 15, Weslaco, Hidalgo County:
W. H. FRIEND, B. S., *Superintendent*
E. HOBBS, B. S., *Entomologist*

No. 16, Iowa Park, Wichita County:
E. J. WILSON, B. S., *Superintendent*

TEACHERS IN THE SCHOOL OF AGRICULTURE CARRYING COOPERATIVE PROJECTS ON THE STATION

G. W. ADRIANCE, M. S., *Associate Professor of Horticulture*
S. W. BILSING, Ph. D., *Professor of Entomology*
F. A. BUECHEL, Ph. D., *Professor of Agricultural Economics*
G. P. GROUT, M. S., *Professor of Dairy Husbandry*
V. P. LEE, Ph. D., *Professor of Agricultural Economics*
E. O. POLLOCK, A. M., *Assistant Professor of Agronomy*

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*Dean, School of Veterinary Medicine.
**In cooperation with U. S. Department of Agriculture.

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THIRTY-EIGHTH ANNUAL REPORT

1925

B. Youngblood, Director

INTRODUCTION

The Thirty-eighth Annual Report of the Texas Agricultural Experiment Station System of the Agricultural and Mechanical College of Texas, for the fiscal year beginning September 1, 1924, and ending August 31, 1925, is presented herewith.

During the year, the work of developing the Lower Rio Grande Valley Citrus Experiment Station (Substation No. 15), was about completed, and today it is one of the very best of its kind in the country. The work there is starting off with vigor and should prove to be exceedingly interesting and valuable to the people of the Valley in the shortest time possible.

The development of the Wichita Valley Irrigation Experiment Station (Substation No. 16), was begun, and the work of subduing the soil and developing the property went as far as our funds would permit. During the forthcoming year the work of development will undoubtedly have been completed.

Attention is called to the receipt of the first installment of the Purnell (Federal) fund. This fund became available on July 1, 1925, and amounts to $20,000.00 for the first year and increases at the rate of $10,000.00 a year until a maximum of $60,000.00 a year shall have been reached. The Purnell Fund is not only intended for the support of existing lines of research such as have been conducted from the beginning, but, in addition, also to include such economic, sociological and rural home researches as will bring improvement to rural industry and rural life. The Purnell Act has been referred to by our leading authorities as the most constructive legislation ever enacted on behalf of agriculture in the history of our country. This may be a little too emphatic, but at any rate it is one of the most important pieces of agricultural legislation ever enacted in this or any other country. The work of organizing the studies to be made under this Act is now under way and will proceed as fast as conditions will permit. It is planned to develop a Division of Rural Home Research, with a thoroughly competent research woman as Chief of the Division, to look after all the projects which have a bearing upon rural home problems.

It is pleasing to report that the last Legislature of Texas was very considerate of the Agricultural Experiment Station System in the matter of providing appropriations. The appropriations for the maintenance and support of Agricultural Experiment Station work in Texas during the past biennium amounted to $461,000.00, whereas for the present biennium they amount to $524,375.58.

The Agricultural Experiment Station is one of the five coordinated major divisions of the College, and its function is the conduct of agricultural

research. The Station System comprises a Main Station at College Station with appropriate divisions of work and scientific laboratories, and experiment farms and field laboratories, located in the several agricultural regions of the State as follows:

Divisions:

Administration,
Veterinary Science,
Chemistry,
Horticulture,
Range Animal Husbandry,
Entomology,
Agronomy,
Plant Pathology and Physiology,
Farm and Ranch Economics,
Soil Survey,
Botany,
Publications,
Swine Husbandry,
Dairy Husbandry,
Poultry Husbandry,
Main Station Farm,
Feed Control Service,

Substations:

No. 1, Beeville, Bee County;
2, Troup, Smith County;
3, Angleton, Brazoria County;
4, Beaumont, Jefferson County;
5, Temple, Bell County;
6, Denton, Denton County;
7, Spur, Dickens County;
8, Lubbock, Lubbock County;
9, Balmorhea, Reeves County;
10, College Station, Brazos County;
11, Nacogdoches, Nacogdoches County;
12, Chillicothe, Hardeman County;
14, Sonora, Sutton-Edwards Counties;
15, Weslaco, Hidalgo County;
16, Iowa Park, Wichita County;

Research Field Laboratories:

State Apicultural Research Laboratory, San Antonio, Bexar County;
Research Queen Yard, San Antonio;
Research Bee Outyard, Dilley, Frio County;
Research Bee Outyard, Roxton, Lamar County;
Research Bee Outyard, Seguin, Guadalupe County;
Loin Disease Research Field Laboratory, Bammel, Harris County.

For the State's fiscal year ended August 31, 1925, the inventories of the Texas Station System totaled $911,817.42, exclusive of the property of the College proper which is now being used for Station purposes. This property, consisting of land at College Station and two brick buildings on the campus, all carried in the College inventories and not reported in the Station inventories, is valued at $139,449.69. The total value of all property being used at this time for purposes of the Agricultural Experiment Station System is $1,051,267.11.

WORK UNDER WAY

A brief statement of the work under way, and the results secured, by divisions, is as follows:

VETERINARY SCIENCE

Projects:

1. Loin Disease of Cattle; Adams fund; H. Schmidt, leader.
2. Swellhead of Sheep and Goats; Adams fund; H. Schmidt, leader.
3. Swamp Fever of Horses and Mules; Hatch fund; H. Schmidt, leader.

Loin Disease Studies

The field experiments in the study of loin disease of cattle are conducted upon the grounds of the Loin Disease Field Laboratory, located near Bammel, Harris County, on a ranch of 879 acres. In May there were only 67 head of cows out of an original purchase of 88, made the previous year, so that 30 additional animals were purchased and distributed to the three pastures on the ranch, so as to bring the number up to the original assignment of 24 cows in each pasture No. 2 and 3 and 40 cows in pasture No. 4, with several held in reserve to replenish the numbers where animals were lost from one cause or another. A Hereford bull was also purchased and will be used in order to increase the stock of cattle on the place.

The cows on experiment in pasture No. 2 were continued on a ration of finely ground rock phosphate one part and salt two parts, as reported last year. Even with the addition of a small amount of cottonseed meal, the consumption of this mixture continued to be very unsatisfactory, amounting to less than one ounce of the rock phosphate per animal per day. The animals did not relish the mixture and did not stop the habit of chewing bones. Two of the cows were taken out of the experiment during the winter and placed on a ration of cottonseed meal, in order to save them, and four other cows were very poor and creepy on May 8. It was, therefore, decided to change this mixture to one of equal parts of bone-meal and salt, which was done on that date. The cows relished this mixture and did much better on it than they did the previous winter and spring, and at the close of the year were in much better condition than the control animals in the same pasture.

On February 18, Cow No. 52, a test animal, died from loin disease. This animal was still on the rock phosphate and salt mixture and had not stopped the bone-chewing habit. Of the control animals, No. 51 died from loin disease on June 6. During the year a number of animals in this pasture became very poor and creepy and were placed on a ration of cottonseed meal, in order to save them.

The cows in pasture No. 3 were continued on a mixture of bone-meal and salt, in the proportion of three parts of bone-meal to two parts of salt. Up to the first of January, these cows consumed an average of two-and-one-half ounces of bone-meal per day, and then increased their consumption to three ounces per day per head. On March 5, the consumption dropped markedly and within a few days only about one-tenth of this amount was consumed. This low consumption continued to the middle of April, when it began to increase again and by May 5 it had again reached the allotted amount. It is significant that this drop in the consumption of bone-meal coincided with the appearance of the first green, tender grass in the spring, and that it was observed to an equal degree in all animals on bone-meal.

The effect of the consumption of bone-meal upon the animals in pasture No. 3 was readily apparent during the winter, but since the cows were all suckling calves and since a satisfactory consumption of bone-meal did not set in until rather late in the season, these cows had not gathered enough

strength to satisfactorily carry them through the winter. But the cows on bone-meal were on cottonseed meal only during January, while some of the control cows were placed on cottonseed meal during the fall of the year. No trace of loin disease was found in this pasture during the year, though eight cows died from other causes.

The cows in pasture No. 4 were continued on two parts of bone-meal and one part of salt. At the close of the year they were in a condition far superior to that of the control animals. None of the test animals developed creeps during the summer, while seven of the control cows showed a distinctly creepy condition. During the year, none of the test animals died from loin disease or showed any symptoms of it, while seven of the control animals in this pasture developed the disease and died. Furthermore, one bull running in this pasture developed loin disease and died. The loss from loin disease among the control animals in this pasture amounted to 27 per cent, while the loss from the test animals was nothing.

It is of interest to note the behavior of four animals with reference to the bone-craving habit, when placed on bone-meal and salt mixture. Four animals that had never failed to chew a bone when opportunity presented itself, were placed on the bone-meal and salt mixture on May 1. These four animals ate the mixture at the rate of three ounces per head per day. Weekly tests showed that they continued to chew bones regularly until June 12, when a decided check was noted on the depraved appetite. They no longer so readily took hold of the bones. Three of the animals rolled the bones around on the ground for a while, but did not chew them, while the fourth cow readily took and chewed her bone. The following week, none of these four animals chewed a bone, and during the succeeding weeks one animal stopped entirely, one took to chewing bones again after missing several weeks, another missed several weeks, while the fourth animal chewed bones only a part of the time. None of these animals, however, took hold of the bones so greedily as they did before being placed on the bone-meal and salt mixture.

It developed that the animals on bone-meal and salt, refused to eat the mixture during the early part of March, when the young, tender, green grass appeared on the range, and did not resume eating this mixture until the middle of April.

Aside from the experiments conducted at the Loin Disease Field Laboratory, on the ranch near Bammel, Harris County, other experiments were carried on at the Main Station indoor laboratories. Previous experiments had indicated that not every bone is toxic, and that, therefore, the cultivation of the organism or organisms, if any, responsible for the production of the toxins is an extremely difficult matter. In order that a larger quantity of bones might be worked up in a shorter time than is possible with artificial media in the laboratory, it was decided to attempt to duplicate, as near as possible, conditions in the field, by moistening the bones and placing them in closed cans, so as to permit the growth of organisms; then soaking them in water, and later drenching the animals with this water. In this manner, about two pounds of ground bone were placed in each can

and moistened with 800 cc. of distilled water. The lid was then replaced on the can and the can was placed in a room held at 39 degrees centigrade for eight to ten days. The bones thus treated were then removed from the cans and placed in glass containers, just about covered with distilled water (800 cc.) and allowed to soak for eight to 24 hours. The fluid was then decanted and animals drenched with it, 500 to 700 cc. to an animal, or the amount of fluid received from a batch to an animal. During the year, 108 such drenchings were given, without a single animal developing loin disease. In all, about 290 pounds of the ground bone was used up in this manner, and then ground bone was then dried out and fed to three animals, two of which consumed over 100 pounds each, and yet not one of these animals contracted the disease. The animals ate the dried bones at the rate of about a pound and a half per day per head.

Furthermore, three other animals were fed ground putrid bone, as collected on the prairies in the loin disease district of the State. These ground bones were mixed with three pounds of a mixture of equal parts of corn chops and wheat bran, and in addition each animal consumed about two pounds of the green bone per day per head. One cow got down on August 14 and could not get up again, and died two days later. The remaining two animals consumed 110 and 115 pounds of the putrid bone, respectively, but did not contract loin disease. They ate the bones at the rate of two pounds per head per day.

Swellhead of Sheep and Goats

The field work of the study of swellhead of sheep and goats is done at the Ranch Experiment Station, near Sonora. No cases of this disease have occurred during the year on the ranches where it has been prevalent for several years, due perhaps to the fact that on account of severe drouth the ranchmen have been feeding their sheep and goats. In a number of cases west of the Ranch Station, however, where the animals were being grazed, without any feeding, cases were reported among yearling sheep. Most of these cases occurred during February and March and the losses were light, for as soon as supplemental feeding was resorted to, new cases ceased to develop. Information secured this past year, together with results of previous work, indicates that this disease has a direct relation to malnutrition or deficiencies in the feed or diet of the animals.

During the year some 60 sheep were treated for swellhead on the range near Sanderson, and a recovery of 90 per cent was had. The treatment used was first three ounces of glauber salts in a quart of warm water, and on each day until the animal went on feed he was given a level tablespoonful of the following mixture, in a pint of water: Powdered nux vomica 1 pound, powdered gentian root 2 pounds, and powdered aloes ¼ pound. Some of these were severe cases, rather advanced, showing intense orange coloration of the skin and eyes; dry nose; line of hyperemia below the hair line of the hoofs. Within a few days the coloration of the skin and eyes dis-

appeared and the animals went on feed. The other animals were put on sotol and in about 10 days following the isolation of the first cases, no new cases developed.

Swamp Fever of Horses and Mules

In the study of swamp fever of horses and mules, it was impossible to propagate a virulent strain of virus from the material secured during the previous year. Owing to the severe drouth beginning in June of 1924, the test horses became very poor and weak, so that it was not possible to use them in these experiments.

CHEMISTRY

Projects:

1. Nutritive Values of Feeds; Adams fund; G. S. Fraps, leader.
2. Soils Studies; Adams fund; G. S. Fraps, leader.
3. Plants; Their Composition and Properties; Hatch and local funds; G. S. Fraps, leader.
4. Composition and Properties of Soils; Hatch and local funds; G. S. Fraps, leader.
5. Human Food; Its Composition, Properties, Utilization, and Preservation; Hatch and local funds; G. S. Fraps, leader.
6. Feed Analyses and Investigations; Feed Control and local funds; G. S. Fraps, leader.
7. Sulphur; Its Value to Texas Soils and Crops; cooperative study; funds provided by Freeport Sulphur Company; G. S. Fraps, leader.
8. Pecan Soils in Texas; Local and State funds; G. S. Fraps and W. T. Carter, leaders.

Soils

Studies of the potash of soils and the composition of typical soils have been continued, and chemical analyses and pot experiments have been made on a number of soil types. Bulletin No. 325 contains the results of some of this work, and indicates a close relation between the active potash lost in cropping and the potash withdrawn by crops.

Digestive Studies

Digestion experiments with sheep and chickens have been continued. There were 13 experiments with chickens, and 11 for sheep. The study of the sugars, starches, pentosans, and other constituents of feed has been carried on during the year. Two important bulletins dealing with feeds were published, one discussing the cost of digestive protein and productive energy under different conditions, and the other containing a tabulation of all American digestion experiments, with a study of their variations and production coefficient for calculating the productive energy of feeds.

Sulphur

The study of the sulphur content of soils and rainwater and the effect of sulphur on soils and crops has been continued, in accordance with the plan of the project. This study is being made in cooperation with other divisions of the Station, and is financed from funds provided by the Freeport Sulphur Company, of Freeport, Texas, under the terms of a cooperative agreement entered into with the Director of the Station.

Feed Analyses

A total of 2056 samples of feeding stuff have been analyzed for the Feed Control Service during the year, in addition to investigations of feeds and their adulteration made at the request of the Feed Control Service.

Fertilizer Control

The Chief of the Division of Chemistry of the Agricultural Experiment Station is also State Chemist and the analyses and investigations of the Feed Control Service are made under his supervision. This consolidation of chemical work is both economical to the State and efficient in placing investigations at the immediate service of the Control Service.

There was a slight decrease in fertilizer sales in the season of 1924-25, the sales being 113,009 tons as compared with 125,180 tons in 1923-24. The sales of the standard formulas, however, increased from 12,145 tons in 1923-24 to 19,633 tons in 1924-25, showing decided appreciation of these formulas on the part of the buyer. As previously pointed out, the use of these standard formulas will reduce cost of plant food to the farmer, resulting in decided savings.

The usual inspection and control of fertilizers was exercised, and the results of the analyses are published in Bulletin No. 335. Investigations of the Experiment Station have aided materially in enforcing the law and in assisting the farmer in the intelligent use of fertilizers.

The State Chemist was Referee on Fertilizers for the Association of Official Agricultural Chemists of North America during the past year, as well as a member of the Committee on Definition of Terms and Interpretation of Results on Fertilizers.

The income of the Department for the year was $26,082.97, expenses $19,537.15, and $6,000.00 was turned over to the College as authorized by law.

HORTICULTURE

Projects:

1. Breeding Work with Dewberries and Blackberries; Hatch and State funds; H. Ness, leader.
2. Studies of the Indian Cling Peach; State funds; A. T. Potts, leader.
3. Orchard Test of Plant Introductions; State funds; A. T. Potts, leader.

4. Studies of *Vitis vinifera* Grapes; Hatch and State funds A. T. Potts, leader.
5. Citrus Fruits at Substation No. 1, Beeville; State funds; A. T. Potts, leader.
6. Adaptability of Fruits for the Toyah Valley; State funds; A. T. Potts, leader.
7. Plant Propagation (Nursery); State funds; A. T. Potts, leader.
8. Figs; State funds; A. T. Potts, leader.
9. Pecans; State funds; A. T. Potts, leader.
10. Pomelo Production; State funds; A. T. Potts, leader.
11. Vegetable Production Studies; State funds; A. T. Potts, leader.
12. Peach Production; State funds; W. S. Hotchkiss and A. T. Potts, leaders.

The horticultural work at the Lower Rio Grande Valley Station is being developed in a satisfactory manner, and the condition of the field and plant work there indicates that highly efficient experiment work will be possible at that point.

Berry Breeding

The berry breeding work has been continuous since 1907, and during that time several promising hybrids have been developed, among which is the Nessberry, a raspberry-dewberry combination. Several thousand plants of the Nessberry have been distributed up to last year, but now that it is a commercial plant, its distribution will not be continued by the Station. Effective July 1 of 1925, this study was transferred from the Adams fund to the Hatch and State funds.

Indian Cling Peaches

Studies of the Indian Cling peach have been discontinued, owing to the fact that the trees were variable and not true to type.

Plant Introduction Orchard

In the orchard test of plant introduction there are about 250 plants of various kinds, set for observation under orchard conditions. Several varieties of jujubes fruited heavily, and one S. P. I. No. 36854, is of high quality and its adaptability to this locality and the State has been proved. The Methley plum continues productive and deserves further distribution. In 1925, 300 rooted cuttings of the Myers lemon were planted at the substations at Beeville, Angleton, Beaumont, and Temple. The young plants passed through the winter of 1924-25 in fairly good shape. There were some losses from cold so that this variety did not show the resistance it was reported to possess. Older trees, however, were more resistant, and since this is an excellent variety, it is considered promising at this time. Several

hundred new varieties of peaches, nectarines, plums, persimmons, apples, jujubes, pomegranates, and pears, were planted out during the spring, but owing to the drouth, made very little growth before the close of the fiscal year. Choice citrus buds, received during 1924, were inserted in sour stocks for use at Beeville and the Lower Rio Grande Valley Station. Practically all of those at Beeville were lost, but those at the Lower Valley Station made satisfactory growth and have been set in permanent orchard form. *Tamarix articulata* (Athel) continued to make satisfactory growth, and the indications are that it will be a valuable tree in the southern part of the State. It was injured to some extent by the cold at College Station, and had to be cut back at Beeville, but went through the winter at the Lower Valley Station without injury.

Vitis vinifera Stock

Studies of the *Vitis vinifera* grapes have been discontinued, for the reason that the vineyard has died down to the point where it is not longer available for experiments.

Citrus Studies at Beeville

Citrus fruit studies have been carried at Substation No. 1, Beeville, since the establishment of the Station. The present orchards consist of three different plantings. The south four rows of the east orchard planted in 1905 and consist of Satsuma oranges, pomeloes, and kumquats. Ten rows north of these were planted in 1910 and consist of oranges, pomeloes, lemons, and citranges. The west orchard was planted in 1907, and consists of oranges, pomeloes, lemons, and limes. Beginning in 1914, individual tree records were kept and certain Satsuma trees have made very satisfactory records. Most of the other varieties were not profitable over this period of years. All citrus fruits at Beeville were severely damaged by the freeze of December, 1924. In many cases the trees were killed outright, and in nearly all cases they were killed back to the trunks. The trees which had matured a heavy crop of fruit seemed most severely injured.

Fruits for the Toyah Valley

At Substation No. 9, Balmorhea, in 1924, an orchard was planted out for the purpose of testing the adaptability of fruits for the Toyah Valley. The first plantings, made in March of 1924, consisted of apples, pears, peaches, plums, cherries, apricots, prunes, almonds, walnuts, grapes, and berries. In addition to these plants, seed of pecans and walnuts and cuttings of grapes were planted. The first summer was exceedingly hot and dry and the root rot was prevalent, causing considerable losses among these young plants, but replanting and new plantings were made, so that the orchard is now in good shape for experiment work.

Plant Propagation

Plant propagation work to study nursery practices and the methods of assexual reproduction was started in 1923, by planting out peach, plum,

pecan, and other seeds for stock plants, and the setting of cuttings and divisions of other plants in 1924. The evergreen tamarix *(Tamarix articulata)* has shown remarkable drouth and heat resistance, about 88 per cent of these plants becoming established, while the loss with Arizona cypress amounted to about 90 per cent. *Prunus americana* seedlings, used as peach stocks, suffered less from drouth than peach seedlings. Very poor germination was secured from peach, pecan, and other seeds.

Figs

Studies of the fig are being made at Angleton, Beaumont, and the Main Station, and these studies are divided into three phases; fertilizers, spraying, and varieties. Early indications are that potash and a complete fertilizer both gave increased growth. Both sprayed and unsprayed plats showed presence of fig rust, and the work with varieties has not yet yielded definite results.

Pecans

The study of pecan production is divided into a number of subprojects, and will cover every phase of the subject. During 1924, seed were planted at the Main Station, Temple, and Balmorhea, with the idea of producing stocks suitable for the development of the work. In no case have the seedlings made satisfactory growth.

Pomeloes

In the pomelo (grapefruit) production studies, the ten-acre orchard of Marsh Seedless pomeloes (grapefruit) at the Lower Rio Grande Valley Station is being utilizezd. The study will embrace soil management, fertilizers, irrigation, insect control, and pruning.

Vegetables

Grouped under the head of vegetable production studies, work is being done with onions, carrots, beans, beets, potatoes, lettuce, and cabbage. The Certified Triumph seed potatoes from South Dakota gave most satisfactory yields. Both vines and tubers were practically free from disease this year.

RANGE ANIMAL HUSBANDRY

Projects:

1. Feeding and Killing Qualities of Steers; State and cooperative funds; in cooperation with Bureau of Animal Industry, U. S. Department of Agriculture, and the King Ranch, at Kingsville, Texas; J. L. Lush, and W. H. Black (for B. A. I.), leaders.

2. Study of the Inheritance of the Fur Qualities of Karakule Sheep; State and Hatch funds; J. L. Lush, leader.

3. Determination of the Relation of Skinfolds to Weights of Fleeces on Rambouillet Sheep; State and local funds; J. M. Jones, and J. L. Lush, leaders.

4. Type and Inheritance in Angora Goats; State and local funds; J. M. Jones, and J. L. Lush, leaders.

5. Inheritance in Brahma and Hereford Cattle; Adams, State and local funds; J. L. Lush, leader.

6. Inheritance of Ridgling Characteristics in Goats; State and local funds; J. L. Lush, leader.

7. Inheritance of Horns and Wattles in Toggenburg Goats; State and local funds; J. L. Lush, leader.

8. Fattening of Lambs on Grain Sorghums and Corn; State and local funds; J. M. Jones, leader.

9. Fattening Steers on Sumac Silage, Sumac Fodder, and Cottonseed Meal Rations, Supplemented with Ground Milo Heads and Cottonseed Meal; cooperative with Bureaus of Animal Industry and Plant Industry, U. S. Department of Agriculture; leaders; W. W. Sheets, (B. A. I.), and F. D. Keating (B. P. I.), and J. M. Jones, for Station.

10. Insects and Internal Parasites Affecting Livestock; cooperative with Bureau of Entomology, U. S. Department of Agriculture, leaders: F. C. Bishopp, and O. G. Babcock (B. E.), and D. H. Bennett, and J. M. Jones, for Station.

11. A Study of the Adaptation of the Corriedale Sheep to Southwest Texas Conditions; in cooperation with the Bureau of Animal Industry, U. S. Department of Agriculture; J. M. Jones, leader.

12. An Economic Study of Shearing Sheep Once versus Twice a Year; State and local funds; J. M. Jones, leader.

13. Determining Grades and Shrinkages of Texas Wool and Mohair; State and local funds; J. M. Jones, and Frank Grayson, leaders.

Relation of Skinfolds to Weights of Fleeces

In the studies seeking to determine the relation of skinfolds to weights of fleeces, twenty-one head and body measurements have been taken each year, and individual fleece scouring records have been secured annually. Aside from this, a sketch is made of the body skinfolds of each sheep, and three representative samples of wool are taken from each animal each year, and then 300 wool fibers are carefully measured as to diameter, from each sheep, each year.

Inheritance in Karakule Sheep

The studies of inheritance in Karakule sheep are conducted at Substation No. 7, Spur, and the work, in progress since 1912, has rather clearly demonstrated that the Karakule is not the most practical breed of sheep for that region. Future work in these studies will be along the lines of a small amount of inbreeding to see whether or not greater uniformity in pelts may be produced. The Karakule flock now consists of 30 animals and is now of sufficient size that culling may be practiced each year.

Inheritance in Angora Goats

The objects of the study of inheritance in Angora goats are to determine, if possible, the mode of inheritance of such characters as scale, type and conformation; quality and weight of fleece; flat locks and spiral ringlets; and kemp, the coarse white dye-resistant hair so common in Angora goat fleeces. Twenty-one head and body measurements, including individual fleece scouring records have been taken from each animal being studied during the past three years. A fine imported South African Angora buck was purchased during the past summer and added to the flock. This buck will be bred to a representative number of registered females during the next season, and his merit will not doubt be reflected in his get.

Inheritance in Brahma and Hereford Cattle

The objects of the study of inheritance in Brahma and Hereford cattle are to determine the methods of inheritance of size, color, body-shape, earliness of maturity, hardiness, fattening ability, and dressing percentage, and the work has progressed in a satisfactory manner during the year. The second and third crops of steers dropped at the Ranch Station were fattened out and marketed during the year. In general, it was noted that the cross-bred steers did not gain quite so fast in the feedlot as the Herefords, but it is possible that this was due to a difference in fatness when put on feed. The Brahma cross-breds uniformly dressed out higher when slaughtered. This difference in dressing percentage is almost entirely due to the greater size of the stomachs and intestines in the Herefords. Butchers, however, do not desire carcasses of the characteristic shape of most Brahmas, and are frank to say so, though it is difficult to see any intrinsic reason in the structure or color of the meat or in the proportion of the various cuts, which would justify this pronounced choice on the part of the butchers. The fifth crop of first-cross calves containing Brahma blood, and the second crop of back-cross calves sired by Herefords, were dropped during the past year. The first-cross calves do not appear to be as good as those sired by the first Brahma bull used, and the back-cross calves are large and blocky and easily the most profitable calves so far produced on the Ranch Station.

Inheritance of Horns, Wattles, and Color in Toggenburg Goats

The progress of the study of inheritance of horns, wattles, and color in Toggenburg goats has been so satisfactory that the results have been written up for publication, and the project is now considered as completed. It was found that horns were inherited as a simple Mendelian recessive, and that wattles were inherited as a simple Mendelain dominant, and that neither of these two characteristics was linked to the other. The inheritance of horns in goats is thus very similar to the inheritance of horns in cattle, but is somewhat different from the inheritance of horns in sheep. The inheritance of wattles in goats seems to be exactly similar to the inheritance of wattles in swine, and may be similar to the inheritance of

wattles in sheep, although the data upon the inheritance of wattles in sheep very inadequate. Color was shown to be inherited in these goats because there was a rather strong resemblance between the color of kids and of their dams. The Mendelian basis for the inheritance of color was not demonstrated, but the conditions of the experiment were such that it would have been difficult to detect the Mendelian nature of the inheritance of color.

Feeding Experiments

In the cooperative study of the fattening and killing qualities of steers, conducted at the King Ranch, 100 head of calves were fed out at Kingsville and detailed records of their weights and gains and of the quantities of feed consumed, were taken. They were slaughtered in the packing plant at Fort Worth and the most extensive series of data ever taken on the weights and measurements of the various organs of beef cattle in a commercial plant, were secured. A partial analysis of these figures shows that for the most of the organs and parts, there was no real difference between the breeds. Publications of the results will be made when formal and specific approval of the Bureau of Animal Industry is secured.

An extensive test was made at Substation No. 7, near Spur, to determine the relative feeding values of good ground shelled corn and the leading grain sorghums for fattening lambs. This Station has during the past several years devoted considerable attention to the production, improvement, and the feeding value of the grain sorghums, which are among the safest and most reliable feed crops for West Texas. The grain sorghums rank third in Texas in value, being exceeded in value only by cotton and corn, and before the feeding work was begun by the Station, the feeding value of the grain sorghums was considered to be 85 to 90 per cent that of corn, and corresponding differences were maintained in the open markets for these two classes of feed. The lamb feeding work at Spur, however, has shown that the grain sorghums have practically the same feeding value as corn. In five tests made, using ground threshed milo, kafir, feterita, and ground shelled corn, the kafir produced the greatest gain two different times, and each of the others produced the greatest gain in one of the other tests. The results of the past year's feeding tests will soon be presented for publication, and this information, along with that contained in the other reports of feeding experiments, should be sufficient evidence for the proper understanding of the relative values of these feeds. For this reason, it is not expected that the feeding tests with grain sorghums in comparison with corn will be continued longer.

Steer Feeding

A steer feeding experiment was conducted at the Dry-Land Experiment Station at Big Spring, Texas, in cooperation with the Bureau of Animal Industry and the Bureau of Plant Industry. In this work it is proposed to determine the relative feeding values of Sumac silage, Sumac fodder, and

cottonseed hulls as sources of roughage in the ration of fattening calves. This test will be repeated during the coming year, after which the results may be published.

Insects and Parasites Affecting Livestock

The cooperative studies of insects and internal parasites affecting livestock made at the Ranch Station, in cooperation with the Bureau of Entomology, include the goat louse, the screw-worm and wool maggot, and the sheep scab mite. Because of the fact that the life-history must first be worked out for the goat louse and the wool maggot, special attention has been given to the study of the sheep scab mite. Studies are being made of sheep scab; its occurrence, prevention, and cure, from the viewpoint of the animal parasite entomologist, the veterinarian, the livestock inspector and the ranchman, including a study of the scab mite, its life-history on the host, and life-history off the host. An obstacle encountered in this connection was that of building up an infestation. As a result of last year's work, it was found that sheep scab infestations develop very slowly during the hot and dry summer periods, and the study has thus far revealed the fact that a sheep may carry the sheep scab mite through an apparently dormant stage extending over a number of weeks. This study of the sheep scab mite is apparently the first of its kind in the United States, though the Union of South Africa is carrying on similar tests. The results secured thus far are coinciding, in the main, with those secured in South Africa.

Corriedale Sheep

In cooperation with the Bureau of Animal Industry, a study is being made of the adaptation of the Corriedale sheep to conditions of Southwest Texas. The study has been going on since 1920, and while a rather small flock of sheep has been available, the indications at this time are that this breed is not as well adapted to Southwest Texas conditions as the fine-wool breeds. It is probable that this project will be revised during the coming year, so as to include studies of the monthly growth of wool.

Shearing Sheep Twice a Year and Once a Year

The studies comparing shearing once a year with shearing twice a year, during the five years they have been under way, indicate that the 12-months fleece in the aged ewe class averaged 8.95 pounds, as compared with 9.37 pounds for the combined fall and spring shearings in the same class sheared twice a year, or a difference of only .42 pound per head. In the yearling ewe class, the group sheared twice a year showed an advantage of .57 pound over that sheared once. The wethers used in this test showed an advantage of 1.92 pounds per head for those sheared twice a year, while the yearling muttons sheared twice a year produced .48 pound per head more wool than those sheared once a year. Summarizing all groups, however, twice-a-year shearing produced only .52 pound more wool than shearing once a year. Viewed from the standpoint of wool production alone,

shearing twice a year can hardly be regarded as the most profitable plan under Texas conditions. The ewes in this test on the Ranch Station show that those sheared once a year produce an average lamb crop as high as those sheared twice a year, and show no heavier winter losses.

Grade and Shrinkage of Texas Wool

Studies of the shrinkages and grades of Texas wool and mohair are being made in connection with the operation of the wool and mohair scouring plant, and a number of representative growers of the State are sending in samples of wool and mohair for this work. During the five years this plant has been in operation, more than 500 separate scouring tests have been made for producers of the State, and more than 1000 samples of the Station's production have been scoured and tested.

ENTOMOLOGY

Projects:

1. An Aphid Study to Determine the Factors Which Influence the Formation of Wings; Adams fund; H. J. Reinhard, leader.
2. A Study of the Ingestion of Poison by the Cotton Boll Weevil; Adams fund; F. L. Thomas, leader.
3. Cotton Insect Investigations: Boll Weevil; State funds; E. Hobbs, leader.
4. Life-History of the Cotton Hopper and Its Control; State Funds; F. L. Thomas, and H. J. Reinhard, leaders.
5. Miscellaneous Insect Investigations: Control of Ants on Citrus Fruits; State funds; F. L. Thomas, and W. H. Friend, leaders.
6. Beekeeping Investigations; State funds; H. B. Parks, leader.
7. Foulbrood Inspection; State funds; F. L. Thomas, and C. S. Rude, leaders.

Aphid Studies

Starvation tests with cotton aphids were continued in the fall of 1924, but as the season developed it was apparent that while starvation has a strong tendency to produce winged forms, it was not the only factor involved and did not explain the abundance of alate forms which occasionally appear. The observations made this season with reference to the effect of temperature show that cold is no more of a factor than heat in producing winged forms. Large numbers of alate forms have been produced in cages where the temperature rose to 110 degrees Fahrenheit. The maturity of the cotton plants is evidently not a factor, for when the lice are abundant the winged forms appear in large numbers on young cotton plants as well as on the mature plants. Previous work under this project indicates that there is no tendency for winged forms to appear in alternate generations. In those cases during the past year where winged forms appeared in numbers, the lice were abundant and crowded. It was not uncommon to find 50 per cent of alate forms among lice when crowded. This includes those

which were nearly mature and which would possess wings. Immature forms were not included, but were counted so as to record the amount of crowding. Measurements of the leaves have also been taken to obtain relative factors for comparison. In one instance, as many as 85 per cent of the mature and nearly mature forms possessed wings. More data are now being gathered on this phase of the study and it is expected that the main conditions under which wings are produced will soon be isolated, after which a study of the influence of food upon wing production will be taken up.

Ingestion of Poison by the Cotton Boll Weevil

In the studies of the ingestion of poison by the cotton boll weevil, 1300 weevils were collected during the fall of 1924, and placed in hibernation cages, and as they emerged in the spring preliminary tests were made. As a result of careful observation of these and many other weevils in late summer, no instance was ever found in which the weevil used the beak for grooming itself. When the antennae need cleaning, the legs perform the service, and when something objectionable occurs on a tarsus, one of the adjacent legs is used to attempt removal of the substance. In moving about the plants or while in a vial, the weevil touches the surface frequently with the tip of its beak. Particles of dust or other foreign substances may be picked up by the mandibles, and in one instance a piece of straw was seized. The mandibles continually work back and forth at the end of the rostrum as the insect moves about. If a weevil is allowed to travel over a glass surface which has been subjected to the dust cloud, the tip of the beak will immediately become covered with the white dust. Although well fed, paralysis and death will begin to occur among a group of such weevils in from three to eight hours. Only 6.4 per cent of the weevils emerged at College Station, on account of the hot dry weather, and this hampered the work. Larger scale operations, however, were conducted in the southern part of the State, using 750 weevils in three different experiments. An average of 25 per cent of the weevils were killed during the first 24 hours in cages where the entire plants were dusted. For the second, third, fourth, and fifth days, the average percentages killed were 36, 14, 13, and 9, respectively. In other cages, the squares and bolls were first enclosed in paper bags, the plants were dusted and then the bags removed. The food was, therefore, fresh, abundant, and untreated. The average percentage of weevils killed on each of the five days was 13, 18, 12, 9, and 4, or a total of 52 per cent, as compared with a total of 88 per cent where the entire plants were dusted. There was practically no mortality in the check cages.

Cotton Insect Studies

An attempt has been made to secure information on the winter survival of the boll weevil, under the studies of cotton insects. A complete record of the daily and accumulative emergence, as well as the percentage of accumulative emergence has been kept. Weevils were first removed March 10, and the last one emerged June 29. On April 12, 50 per cent of the emergence had taken place. The survival was 6.4 per cent. This in-

formation is transmitted to the Delta Laboratory of the United States Department of Agriculture, at Tallulah, Louisiana, every two weeks, in order that the information may be used by the Federal men working along the same line.

Probably the most important piece of work done by the Division of Entomology during the past year has been in connection with the life-history studies of the cotton hopper. Three methods were used in obtaining information concerning the relationship of the insect *Psallus seriatus* to the blasting and shedding of very small squares in cotton, as follows: (1) By introducing nymphs and adults obtained from various sources into large four-by-four cages placed over cotton plants; (2) by confining nymphs and adults to a bud-cluster by means of a cheese-cloth sack; (3) by confining under lantern globes on potted cotton plants. More than 10,000 adults and 3,000 nymphs were used in the cage experiments. The data obtained showed that the nymphs are capable of producing greater injury than the adults, and that nymphs obtained from horsemint caused more injury in proportion to the numbers introduced, than nymphs obtained from Croton. Where the nymphs lived and were recovered in the cheese-cloth sacks, the terminal bud which would produce a leaf was almost invariably injured. Similar injury appearing in from three to eight days could also be produced by confining adults under lantern globes. It has, therefore, been proved that this insect is a very large factor in producing the blasting of minute cotton squares. The egg-stage of the insect has been found in the tender growth of cotton plants, five species of Croton, and two species of Monarda. Eggs have been found in remnants of cotton stalks which were broken up and plowed under during the winter and then brought to the surface by cultural operations in spring. Croton plants which are permitted to grow in late summer and fall contain large numbers of eggs, and where weedy and neglected fields are planted to cotton the following spring, injury by the cotton hopper is very likely to develop. The over-wintered eggs first began to hatch on April 2 and continued until the middle of May, though 58 per cent of the nymphs from over-wintered eggs hatched before the first of May. Adults were first found in the field on Croton weeds on April 21. The insects remained on these weeds, gradually increasing in numbers and reaching the maximum in September. There was no migration from Croton weeds to cotton. The infestation on cotton in the vicinity of College Station was so light that the crop was not materially damaged. The life-history may be briefly stated as follows: When laying eggs, the female pierces the plant tissue of the tender stems by means of her ovipositor. In the laboratory, a maximum of 11 eggs were laid during a 24-hour period. The maximum number produced during the life of a single pair was 34 eggs. They are laid singly. The egg-stage averages 7.8 during the active period, varying from 6 to 11 days. There are five instars, or nymphal stages, of which drawings have been made. The average length of each nymphal period varies from one and one-half to two days, in summer. Complete development from hatching to adult stage occurs in from 7 to 10 days, but in fall may require five to six weeks. The generations are not distinct, as

there is great overlapping. Artificial control measures were applied in the early part of the season, at College Station and near Corpus Christi, but since very little infestation developed on the check plats, the tests were discontinued. As the result of 13 tests conducted near College Station, using the dust form of flowers of sulphur, superfine dusting sulphur, sulphur-napthalene, sulphur-lime, copper-lime, calcium fluosilicate, derrisol spray, nicotine sulphate spray, it was found that any of them would reduce the infestation, but that best results were obtained from those containing sulphur. Sulphur-napthalene gave better control than straight sulphur, but none of the dusts appeared to have killed the adult insects. The immature stages of the cotton hopper are most susceptible, an average of 92 per cent control having been obtained with sulphur-napthalene, and 85 per cent with sulphur.

Ants on Citrus Fruits

In the miscellaneous insect studies, the control of ants on citrus fruits has been taken up at the Lower Rio Grande Valley Station, where the ants which attack and sometimes girdle young citrus trees have been identified as *Solenopsis geminata*. These ants do not trouble the trees in spring or summer, mainly because of the presence of other crops, chief among which is corn. When the land is cleaned up in the late fall, the ground harrowed, and none of the ant's usual food available, the insects migrate to the citrus trees and frequently do considerable damage. They live in shallow nests at the base of the trees, frequently carrying the soil up on the side of the trunks. The ants work under this thin layer, cutting the bark of the trees and feeding upon the sap or gum. Sometimes a nest is made in the tree at the point where branching begins. In the experiments to control this insect, it was found that calcium cyanide B dust, applied with a bellows and dusted to the nest while the ants were disturbed, gave 100 per cent control. The creosote band was also safe and effective.

State Apicultural Research Laboratory

The State Apicultural Research Laboratory is located 12 miles east of San Antonio, in Bexar County, on a tract of 10 acres of land owned by the Station, and is exclusively for beekeeping investigations. In addition to this Laboratory, there is a queen-rearing yard, near San Antonio, and bee outyards located at Dilley, Frio County; Roxton, Lamar County; and Seguin, Guadalupe County.

A study is being made of the winter activities of bees, in which data are collected on weather conditions, weight of colony, and weight of food supplies during the winter period under different conditions of housing. Because of the long continued cold, the winter of 1924-25 gave much valuable information on this study.

Experiments are being conducted in determining the values of various plants for bee culture. Weather conditions during the year brought out very clearly the fact that mesquite blooms open freely only under the death impulse. In order to test their honey production values, 14 varieties of

cowpeas were planted, but none of them bloomed. Twenty varieties of ornamentals were grown in a variety test, without results, and two varieties of sweet clover died before blooming.

Results of the studies of royal jelly in natural and artificial cells and of the relationship between the size and the shape of the queen cell and the resultant queen, were reported in Circular No. 35, issued during the past year. Notes taken in the experiment studying the deviation from the normal of queens that have emerged beyond their common period, indicate that the longer the metamorphosis, the higher colored the queen. It was also found that workers and drones follow the same rule. Extenisve studies have been made of the so-called anger of the newly emerged queen toward the queen cells, and the results will be available for publication soon. Observations made during the past four years indicate that the earliest age at which queens begin the laying of eggs to be four days, and the latest was 18 days; the normal being 10.9 days. These observations indicate that if the queen is not laying on the eleventh day, she should be replaced.

Studies are being made of the nests of all hymenopterous insects to ascertain if diseases are present therein. In studying nests of the mud-dauber containing the pupae of tachinid flies, it was found that the flies actually cut their own way through the mud walls, and it was found that the Texas agricultural ant nests contain at least two brood diseases, or conditions caused by chilling or overheating which closely resemble disease. It was found that each "hill" in the nests of this ant is really the home of numerous queens and their families. Because of the wide separation of these separate colonies throughout the hill, they are very difficult to kill out; a gas torch being found to be the most effective agent of eradication.

A summary of the observations made in the study of a condition in queens which resembles catalepsy among mammals, indicates that all queens recover from this trouble in a few seconds of time, especially when they are surrounded by worker bees. Insofar as the experiments thus far go, this trouble does not seem to be a nervous disease, but a death faint resorted to by many insects in order to escape attention.

Studies in apiary economics indicated the value of wholesale requeening every year. A study of the composition and use of candy as food for bees during shipment gave better results from candy made with sugar containing starch, than from sugar without starch. For the first time known, huajilla has been grown from the seed to the blooming stage, and the working out of the plan and methods by which this plant may be grown to maturity will be of inestimable value in the production of honey plants.

Foulbrood Eradication

Following is a brief report of work done under the provisions of the State Foulbrood Law for the purpose of protecting an industry which brings a cash income of over $3,000,000.00 to the beekeepers and farmers of Texas.

In spite of many changes the work went steadily forward. During the year ending August 31, 1925, 40,557 colonies of bees were examined for American foulbrood and other infectious diseases. The inspection covered

67 counties comprising the most important beekeeping territory of the State. American foulbrood was found in 24 counties. A total of 408 colonies were infected, or approximately one per cent of the number examined. All of the infected colonies were destroyed. This is the first time in the history of the inspection work that every case of disease found has been burned. Three of the 24 counties where disease was found had only one case each, while six of the counties had more than 25 cases each. The field work is continuous, beginning about the first of February and lasting until about the middle of November.

No European foulbrood was found in 1924-1925.

Forty queen breeding apiaries were inspected and certificates granted to the breeders. All certificates used during the past season were printed under contract and distributed from this office, 11,500 copies being issued. The system works smoothly and many of the difficulties previously encountered have been avoided.

A complete report of the inspection work up to September 1, 1925, appeared in printed form as Circular 36 of this Station at the beginning of the fiscal year 1924-1925. Circular 38, now in the course of being printed, is a biennial report of the work for the period 1923-1925.

AGRONOMY

Projects:

1. Oat Investigation and Oat Improvement; Hatch and State funds; A. H. Leidigh, leader.
2. Rotation, Fertilizer, and Soil Improvement; Hatch and State funds; E. B. Reynolds, leader.
8. Crop Improvement Studies; State funds; E .B. Reynolds, leader. leader.
4. A Fundamental Study of Inheritance in Cotton; Adams and State funds; G. N. Stroman, leader.
5. Crop Variety Tests; State funds; E. B. Reynolds, leader.
6. Time and Method of Intertillage; State funds; E. B. Reynolds, leader.
7. Time and Method of Seedbed Preparation Studies; State funds; E. B. Reynolds, leader.
8. Crop Improvement Studies; State funds; E. B. Reynolds, leader.
9. Rate and Distribution of Seed and Time of Thinning Cotton; State funds; E. B. Reynolds, leader.
10. A Study and Improvement of the Peanut; State funds; G. T. McNess, leader.
11. Composting Raw Rock Phosphate and Sulphur with Different Soils; State funds, and cooperative funds from Freeport Sulphur Company; E. B. Reynolds, leader.
12. Rice Improvement and Method of Production Tests; State funds, and cooperative funds from The Barrett Company of Texas; A. H. Leidigh, leader.

13. Inheritance in Grain Sorghums; Adams and State funds; A. B. Conner, leader.

14. Wheat Breeding Studies; State and Hatch funds; A. H. Leidigh, leader.

15. An Ecological Study of Pastures at College Station; State funds, and cooperative funds from School of Agriculture; E. O. Pollock, and H. V. Geib, leaders.

Oat Investigations

The oat investigations are being conducted at the Main Station, at Substation No. 5, near Temple, and at Substation No. 6, near Denton. The work at the Main Station in 1924 consisted principally of the variety test and the increasing of seed of T. S. No. 1415, which, so far, is the best yielding oat at College Station; and during the year it made a yield of 54 bushels on the increase field. At Temple, the work was on a rather extensive scale, embracing the variety test proper with the standard varieties, tests with pure-line selections, repure-lining, increasing head-row selections, and the oats nursery. In the selections from pure-line oats, 41 lots from T. S. No. 1118, 42 lots from T. S. No. 2400, and 39 lots from T. S. No. 776, were tested. The notes taken indicate that the selections of T. S. No. 776 are early and somewhat erect in growth, while those from T. S. No. 1118 and No. 2400 are rather spreading. At Denton, a selection from T. S. No. 118, designated as No. 1118-1, has proved to be one of the best oats for that region of Texas. The outstanding results secured in this study to date are the establishing of a large number of pure-line oats having high yields and increasing the seed for distribution.

Rotations, Fertilizers, and Soil Improvement

The rotation, fertilizer, and soil improvement studies have been under way since 1914, using acid phosphate, acid phosphate and cottonseed meal, acid phosphate and manure; manure; rock phosphate, and rock phosphate and manure, as the fertilizer treatments. The work includes a four-year rotation of corn, oats, cotton, and cowpeas; and continuous cotton and continuous corn. In 1924, the yield of rotated cotton ranged from 193 to 306 pounds of lint to the acre, while the yields of continuous cotton were from 165 to 232 pounds to the acre. For the last 10 years, the best yields have been made from a treatment of five tons of manure reinforced with 200 pounds of acid phosphate for the rotated cotton, while 200 pounds of acid phosphate produced the highest yield of cotton in the continuous cotton. In general, the fertilizer treatments in the continuous cotton produced larger increases in yield as compared with the yield of the checks or non-treated plats, than in the rotated cotton, the gains being 20 and 10 pounds of lint to the acre, respectively. These increases in yield have just about paid the cost of the fertilizers, but the use of the fertilizers could not be stated as profitable. In 1924, the yield of corn was unusually low. In both rotated and non-rotated plats, the larger yields were produced by manure reinforced with acid phosphate or raw ground phosphate rock.

During the 11 years, 1914 to 1924 inclusive, all the fertilizer treatments in the continuous corn have made about the same yields, approximately 17.75 bushels to the acre, or two bushels more per acre than the plats which received no fertilizer treatment whatever. The results of this work to date show that both phosphorus and nitrogen are needed in the soil, but the use of fertilizers on cotton and corn has not been profitable. The rotated cotton produced 25 pounds of lint more to the acre annually than continuous cotton, while rotated corn made a gain of about 7 bushels to the acre over continuous corn.

Soil Moisture and Fertility Conservation

In the soil moisture and fertility conservation studies at Lubbock and Spur, the object is to find suitable cropping systems, including soil-improving crops and practices, best adapted to conditions in Northwest Texas. There are at Lubbock 25 different cropping systems, which include cotton and feterita continuously, manured and unmanured, and in all combinations with fallow and green manure, using sorgo as the green-manure crop. The work at Spur was revised in 1924, omitting the fallow plats and adding an annual legume as a green-manure crop for comparison with sorgo. At Lubbock the largest yield of cotton was 351 pounds to the acre in a four-year rotation of cotton, feterita, green-manure, and fallow, but the yields ranged down to 164 pounds to the acre. The yields of feterita ranged from 17 to 28 bushels to the acre. The results of this experiment for the 10 years, 1915 to 1924 inclusive, show that the uses of green-manure and of fallow have not paid and that probably the alternation of cotton with grain sorghums is the most practicable cropping system to use in Northwest Texas.

At practically all of the substations where agronomic work is conducted, rotation of crops is practiced for two reasons: (1) as a matter of good farm practice, and (2) to observe the effects of rotation on the yield of crops and on the soil, as well as to accumulate and record data thereon. In general, rotation has produced considerably larger yields than continuous cropping to one crop. The rotation of crops at Substation No. 5, Temple, has practically controlled the root rot of cotton, though it has not eradicated the disease.

Plant Introduction studies were carried at the Main Station and at the substations during the year. Subterranean clover, a recent introduction, continued to do well at the Main Station, at Beaumont, and at Nacogdoches. A circular relating to this crop was submitted for publication during the year. *Andropogon annulatus*, grown at Angleton since 1915, has been found to be well adapted to the central and eastern parts of the Gulf Coast of the State. So far this grass has received no appropriate common name, for which reason it has been known as "'Angleton grass." A publication on the subject of this grass is now being prepared for publication.

Cotton Improvement

In the fundamental study of inheritance in cotton, biometrical studies of lint and seed characters have been made on 16 varieties during the year.

The varieties are described with respect to yield of lint, yield of seed, percentage of lint, length of lint, and number of five-lock bolls and number of four-lock bolls. The mean and standard deviations of these characters are taken. The varieties were studied as regards time from planting to flowering and to maturity of boll, in which it was found that there was a difference of four days between earliest and latest varieties with respect to the two characters. This work is of importance to cotton growers and breeders, as it gives the type and variability of many characters of the varieties studied, which form a basis for improvement and strengthening of varieties in certain characters. This work has been reported upon in detail in Bulletin No. 332, submitted for publication about the close of the year. Taking up chlorophyll defiiciencies in cotton, two characters have been studied, one having yellow cotyledons, and the other having areas which developed in chlorophyll. The genetic factors concerned have been isolated and were shown to be inherited; these two characters are important to both the farmer and the cotton breeder. The results of this study are reported in Bulletin No. 333.

Crop Variety Tests

Under the crop variety tests, studies have been made with cotton, corn, and cowpeas. The variety tests of cotton continue to show that the Mebane, Lone Star, Rowden, Truitt, and Acala types are best adapted to conditions in Texas. These varieties have more or less local adaptation. For instance, Rowden is adapted to Central and Eastern Texas, but is too late for Northwest Texas. Perhaps the most striking result of the recent work in this connection is that New Boykin is one of the highest yielding varieties where it has been grown, especially in Central Texas. In the variety-date tests of corn, it was found that Surcropper, Chisholm, Ferguson Yellow Dent, Fentress Strawberry, Hastings Prolific, and Brazos White are the best yielding varieties for the eastern half of the State. The tests further show that corn should be planted early in any given locality, if maximum yields are to be expected. A summary of the results of variety tests of cowpeas at the substations show that New Era, Groit, Brabham, Early Buff, and Blackeye are good varieties for conditions in Texas. The New Era, Groit, and Brabham varieties are, perhaps, better adapted to all the conditions in Texas than the other varieties.

Time and Method of Intertillage

The time and method of intertillage experiments are designed to determine the effects of different methods of cultivation and the presence and absence of weeds on the yield, development, composition, and quality of crops; and also on the structure, moisture, and fertility of the soil. So far the work has been carried on at Chillicothe, Lubbock, Spur, and Beeville, and has been centered on the crop production phase of the matter. Six treatments are included: (1) cultivate once; (2) cultivate twice; (3) cultivate three times; (4) cultivate four times or give frequent cultivation; (5) permit weeds to grow undisturbed; and (6) remove weeds with hoe, but

give no cultivation. Cotton, corn, and milo are the crops used. The most striking result during the year was, as usual, that the plats on which the weeds were permitted to grow undisturbed, produced practically a crop failure. For the eight years, 1917 to 1924 inclusive, the results indicate that the weeds are the principal consideration in tillage operations, and that just enough cultivation to control weeds effectively is the best kind of tillage, and that the ordinary cultivator is perhaps the most effective implement for this purpose.

Seedbed Preparation

In the time and method of seedbed preparation studies, at the Lubbock substation, the largest yields of cotton resulted from early, deep listing and late, deep plowing. For the seven years, 1918 to 1924 inclusive, however, late plowing, both deep and shallow, has produced the highest average yield of cotton, 266 and 226 pounds, respectively, of lint cotton to the acre. At Chillicothe in 1924, the best results with cotton were obtained from listing deep at a late date, while for the period 1919 to 1924, the largest average yields resulted from medium to shallow listing, whether it was done early or late. The general conclusions from these investigations are that fairly early preparation of the seedbed to a medium depth gives best results on soils that do not blow. On soils having a tendency to blow, later preparation is advisable.

Crop Improvement and Seeding Rate Studies

Crop improvement work was carried at the substations in 1924. The results to date include the improvement of the Thomas corn at Beeville and the distribution of this variety in that region and the continuation of the breeding and improvement of Belton cotton at Temple.

Rate and distribution of seed and time of thinning cotton results secured at the substations from 1914 to date show that cotton produces maximum yields when thinned from 9 to 18 inches in rows of ordinary width, except in the sandy lands of East Texas, where wider spacing, from 18 to 33 inches, has given best results. It was shown that deferred thinning decreased the yield as compared with thinning at the usual time.

The study and improvement of the peanut has been followed at Substation No. 11, Nacogdoches. The work was begun in 1917, when 1000 individual selections were made. To date, 16 high yielding selections, or families, have been isolated.

Composting Raw Phosphate Rock and Sulphur

Since 1919 the work in composting raw rock phosphate and sulphur with different soils has been done at Temple, with sulphur as fertilizer, to determine the effect of this substance on the yields of crops and also on the soil. Cotton, corn, and oats in a three-year rotation, and continuous cotton, are used in the experiment. Sulphur is applied to the land in amounts ranging from 50 to 10,000 pounds to the acre. In 1924, the yields of cotton

ranged from 179 to 270 pounds of lint to the acre for rotated cotton, and from 123 to 205 pounds for the non-rotated cotton. The larger applications of sulphur apparently reduced the yields of both cotton and corn to some extent, but seemingly had no effect on the oats. In general, the results of this work to date show that sulphur as a fertilizer has no significant effect on decreasing or increasing the yield of cotton, corn, and oats, and it is indicated that sulphur is not needed as a fertilizer on the heavy black limestone soils of Central Texas.

Rice Improvement

The rice improvement and methods of production tests have been carried at Beaumont, and have included variety tests, selections and fertilizers. Five varieties from the variety tests were found to be worthy of increase. T. S. No. 2204, a good long-grain variety of rice, has indications of good milling qualities. This is a quality which, so far, it has been very difficult to obtain in long-grained varieties. A Japanese variety, T. S. No. 5411, has a good grain of large size which is quite uniform. Nine selections of Texas Fortuna were made from head-row plantings, and increased. These are quite promising selections and should produce excellent seed for distribution during the coming year. The present status of the rice fertilizer work indicates that sulphate of ammonia at the rate of 100 pounds to the acre is the most profitable treatment. Acid phosphate has not increased the yields, but in combination with sulphate of ammonia it gave results similar to those secured with sulphate of ammonia alone. The results on the time of applying fertilizers show that the best returns were secured when the materials were applied at a medium late date, which, in general, was just before the rice reached the boot-stage.

Inheritance Studies With Grain Sorghums

The inheritance in grain sorghum project involves, chiefly, the study of inheritance of four head-characters in kafir, as follows: (1) Number of seed-bearing branches; (2) number of nodes to the head; (3) length of rachis; and (4) length of seed-bearing branches. Two parental lines, Nos. 654 and 223, differing widely from each other with respect to these four characters, were crossed in 1922. Five crosses were made, including both the crosses and reciprocal crosses, and the first generation of these matured in 1923. They were planted in 1924, and the second generation matured. In each of these five crosses, apparently 200 individual plants were obtained as a sample for study. A study of this second generation showed that one cross and one reciprocal cross were hybrids. The other three were evidently failures to obtain hybridization. Phenotypic classification of the second generation of the hybrid material is being made. This classification indicates possible linkage between number of seed-bearing branches and length of seed-bearing branches, with a possibility also of linkage in some other combinations. Two hundred and fifteen second generation heads, comprising all of the heads of the original cross, have been planted in separate rows, during the crop season of 1925, from which to obtain records for gen-

otypic classification of each of these 215 second generation individuals. The detailed work of measuring representative samples from each of these third generation rows is tedious, but when completed should provide abundant data for the study of these four characters. Albinism in kafir mentioned in a previous report, has been studied further and the results indicate rather conclusively that albinos and pure green differ by only a single factor. Virescent whites and other classes appear to be somewhat more complex. During the season of 1925, some 50 to 60 strains of grain sorghum have been isolated from hybrid material and planted in large test plats in comparison with standard varieties.

Wheat Breeding

The wheat breeding experiments are conducted at the Main Station, at Temple, and at Denton. At Temple, the work consisted of the regular variety tests, tests with pure-lines, head-row increases, head-row tests, and spring wheat nursery for rust resistance. Twenty varieties of wheat were included in the variety tests. Durum made the highest yield, 45 bushels to the acre, followed by several strains of Mediterranean, with yields ranging from 26 to 40 bushels. For the seven years, 1918 to 1924 inclusive, Mediterranean types have made the best yields, followed by the Kanred types. Clark's Blackhul, a Mediterranean type, made the highest yield, 23 bushels to the acre, for the four years, 1921-1924. In the tests of pure-lines, 33 selections, mostly of Mediterranean types, were grown. There was considerable variation in yield among the selections within a variety, ranging from 15 to 45 bushels to the acre. A number of these selections are promising, as they yielded considerably above the average of the common wheat of the same variety. Fifty varieties, secured from the United States Department of Agriculture, were included in the spring wheat nursery for observations on rust resistance. The rust varied from nothing to 20 per cent, the plats with the greater percentage of rust making the lower yields. At Denton, the work consisted mostly of variety tests of both winter and spring wheats, rate and date of planting experiments, the increase of desirable varieties, and pure-lines; the testing of 112 pure-line selections from T. S. No. 3015 and 49 selections of wheat from the Ferguson Seed Farms, and the testing of 66 of winter-spring wheat, secured from the Kansas Station in 1922. In the variety tests with winter wheats for the seven years, 1918 to 1924 inclusive, Kanred and Mediterranean have been the highest yielding varieties, producing 24 and 21 bushels to the acre, respectively. Clark's Blackhul, a Mediterranean, is also an excellent variety, Several pure varieties, among which are Kanred, Mediterrnaean, Clark's Blackhul, and selections from these, were grown for the purpose of increasing pure seed. The pure-line selections of T. S. No. 3015, 112 in number, have been grown for three years, 1922, 1923, and 1924. Some of these are promising; one selection made a yield of 44.5 bushels in 1924 and is also the highest yielding selection for the three years, with an average of 27 bushels to the acre. There are indications that there is a possibility of securing high yielding selections from these hybrids, which are more

resistant to leaf rust than Kanred. The wheat work at the Main Station consisted of the variety test, which continues to show the superiority of Mediterranean for this section of the State.

Ecological Study of Pastures

An ecological study of pastures at College Station is being made in cooperation with the Department of Agronomy of the School of Agriculture. The object is to determine the effect of grazing and of fertilizer treatment on the different species of plants in native pasture, the relative persistency of the different species, and the development of the association of species under different treatments.

Seed Laboratory

The seed laboratory which was formerly operated in cooperation with the Federal government, has been continued during the past year by the Division of Agronomy.

Main Station Farm

Significant results have been secured from the statistical study of certain characters of a number of varieties of cotton commonly grown in Texas. Some very promising cotton selections have been secured as a result of the breeding work with Startex cotton, a strain which has been developed on the Main Station. These selections will be increased for distribution.

Corn fertilized with sewer sludge donated by the City of Houston, Texas, made very little gain over untreated plats. The sludge was applied at rates varying from 500 to 2000 pounds to the acre, both alone, and in combination with 200 pounds of acid phosphate. Corn fertilized with barnyard manure at the rate of four tons to the acre, applied alone and in combination with acid phosphate and raw rock phosphate, produced higher yields than the plats receiving no fertilizer treatment and those from which the crop residue had been removed. Four tons of manure and 200 pounds of acid phosphate to the acre gave the outstanding high yielding plat. Corresponding plats on rotated land produced 100 per cent more corn than non-rotated plats, both receiving the same fertilizer treatment. Cotton fertilized with sewer sludge, donated by the City of Houston, made 15 to 20 per cent gain over the untreated plats. The amount of sludge used on the cotton ranged from 500 to 2000 pounds to the acre, and was applied both alone and in combination with 200 pounds of acid phosphate. The plats receiving applications of 1500 to 2000 pounds of sludge to the acre, and those receiving 1000 pounds of sludge in combination with 200 pounds of acid phosphate, produced the highest yields secured in the test. In the test of barnyard manure applied alone and in combination with acid phosphate and raw rock phosphate, the plat receiving an application of two tons of manure to the acre was the outstanding high yielder. The plats from which the residue of the preceding crop was removed, made the lowest yields. Cotton on rotated land made a gain of from 10 to 25 per cent over non-rotated land, when both received the same fertilizer treatment.

PLANT PATHOLOGY AND PHYSIOLOGY

Projects:

1. Texas Root Rot Studies; Adams and State funds; J. J. Taubenhaus, leader.
2. Watermelon and Related Crops' Diseases; Adams and State funds; J. J. Taubenhaus, leader.
3. Tomato Diseases; Hatch and State funds; J. J. Taubenhaus, leader.
4. Spinach Diseases; Hatch and State funds; J. J. Taubenhaus, leader.
5. Pecan Diseases; Hatch, State, and cooperative (with School of Agriculture) funds; J. J. Taubenhaus, and G. W. Adriance, leaders.
6. Effect of Soil Temperatures on the Prevalence or Absence of Plant Disease Epidemics; Adams and State funds; J. J. Taubenhaus, leader.
7. Causes of Diseases of Perishable Crops in Transit; cooperative funds from Western Weighing and Inspection Bureau; J. J. Taubenhaus, leader.
8. Preliminary Studies of the Possibility of Sulphur or Strong Bordeaux Solution Causing What is Termed "Burning" of Foliage in Cucurbits; in cooperation with Division of Chemistry; Sulphur (cooperative with Freeport Sulphur Company) funds; J. J. Taubenhaus, leader.

Cotton Root Rot

The cotton root rot project has been broadened to a State-wide study and studies are being made of the root rot disease as it occurs in East, West, South, and Central Texas. Due to influences of irrigation and because of variations in the susceptible flora in various parts of the State, control methods will necessarily have to differ. In Central Texas, the vine *Ipomoea trichocarpa* is by far the most important summer and winter carrier of the disease. Definite and systematic studies are being continued, to determine how long it would take to eradicate this plant, and the work so far indicates that it will require more than four years of clean fallow to completely destroy this weed pest on the blacklands. This means that a system of rotation using non-susceptible crops, must be used, in connection with clean cultural practices if this perennial tie-vine is to be destroyed. Recent experiments explain why it is that ordinary rotation as practiced by the average farmer fails to control root rot. This is due to the fact that such practices do not destroy the perennial tie-vine, but rather encourage its growth among the non-susceptible crops, and in this way the root rot is held over in the land from year to year. Actual counts in the oat stubble of a three-year rotation of cotton, corn, and oats showed 102,864 sprouted tie-vine seedlings and 5,814 old tie-vine roots per acre, all carrying root rot. The same condition was found to prevail in a four-year rotation of wheat, cotton, guar, and corn. The experiments with sulphur have been continued, and it was noted that due to the accumulative effect of the treatment, applications of 10,000 pounds of sulphur to the acre appeared to

reduce the root rot disease to a minimum, but this treatment did not appear to be beneficial to the cotton, and it is doubtful if this method of soil treatment would be reliable and good economics in the blacklands where the lime content is so high. In the studies of root rot made at Substation No. 9, near Balmorhea, a large number of susceptible weeds were encountered which differ from the susceptible weed flora of Central Texas. These weed carriers are characterized mostly by perennial fleshy roots which carry root rot, but which are themselves not destroyed by the disease. These carriers were found not only on virgin land, but also on cultivated lands. These carriers have been identified and catalogued and the information will be of much value in future studies. Again the past year, large numbers of spores of root rot were found in the Balmorhea region. These spores occur mostly along the irrigation ditches two or three days after irrigations, where the ditches remain moist in portions covered by alfalfa growth which escaped the mowing machine. Likewise, they are common in alfalfa fields in spots with dense growth and more or less shaded from the sunshine. The spores were not found in cotton fields where the ground is more or less exposed to the sunlight. For the first time, during the year efforts to germinate these spores of root rot were successful. The work thus far indicates that these spores are covered with some waxy layer which prevents them from touching water and thereby absorbing moisture. No sooner than this covering is removed and the spores moistened, they begin to germinate. Studies will now be made of the nature of this cover and the viability of the spores. Studies were also made of the cotton root rot in the Wichita Valley, where also a definite weed flora was found which carries root rot in virgin and cultivated lands. This weed flora is also different from that of Central Texas. Experiments during the past year have definitely established the degree of the tolerance of acidity and alkalinity of the Texas root rot fungus. It was found that the root rot fungus is completely inhibited in growth by 0.20 of one per cent of a normal hydrochloric acid, 0.21 of one per cent of normal sulphuric acid, and 5.50 per cent of normal sodium hydroxide. This tends to show that the root rot fungus is extremely sensitive to acidity and that it is considerably tolerant of basic salts. In cooperation with the Division of Chemistry, efforts are being made to determine the percentage of acidity or alkalinity of various soils collected from fields known to be infested with root rot.

Last year the appearance of a fruiting body of *Sclerotium rolfsii,* in pure culture, was reported. During the past year, however, intensive work has shown that this sporophore, or fruiting body, is probably sterile. From all appearances, it propably belongs to either the Hydnanceae or the Thelephoaceae. This organism, however, will be grown continuously on various other media, in efforts to force the sporophore to mature.

Sulphur's Effect on Foliage

During the past year, due to financial aid available through a cooperative study with the Division of Chemistry, under the Sulphur Fund, an experiment has been taken up at the Lower Rio Grande Valley Station

aimed at a determination of why sulphur has a tendency to "burn" cantaloupe foliage. It has been definitely determined that sulphur in its present form cannot be used on cantaloupes or cucumbers, but the study will be continued one or two years longer.

Effect of Soil Temperatures on the Prevalence or Absence of Plant Disease Epidemics

The study of the effect of soil temperature on the prevalence or absence of plant disease epidemics is a continuation of previous work in which soil temperature data are being gathered and classified along with information on the prevalence or absence of plant disease epidemics in various parts of the State. Inasmuch as the information collected has reached the point where it may be published as soon as placed in suitable form, it is planned to discontinue this study.

Tomato Diseases

In the study of tomato diseases, a careful field survey was made of the various tomato diseases as they occurred in East Texas. Because of dry weather, the tomato crop of East Texas was practically undamaged by disease, except Fusarium wilts and blosom-end rot. Evidences in hand now indicate that blossom-end rot is a physiological trouble induced by lack of moisture in the soil. Fusarium wilt, on the other hand, is prevalent in all soils and climatic conditions, and the only way it can be eliminated is through careful crop rotation and the procuring of seed from sources known to be free of this disease.

Spinach Wilt

The new spinach wilt, reported last year, has been determined to be induced by a fungus, *Fusarium solani*. The pathogenicity of this organism has been demonstrated beyond a doubt, this year, not only as isolated from spinach, but also as it was obtained from other sources. Careful studies have been made of the morphology of the organism; its life-history has been worked out, and preparations are being made for the publication of a technical paper on the subject.

Perishable Crop Diseases in Transit

Studies are being made of the causes of perishable crop diseases in transit, under cooperative funds provided by the Western Weighing & Inspection Bureau. Information is being accumulated relative to the prevalence of diseases of fruits and vegetables in transit, and considerable information is also being secured as to the causes of these diseases. In addition to this, valuable information is being gathered as to the various plant diseases which are being introduced into Texas from other states.

FARM AND RANCH ECONOMICS

Projects:

1. Activities of Other States and the United States in Promoting Rural Progress; State funds; L. P. Gabbard, leader.

2. An Agricultural Economic Survey of a Typical Blackland Cotton Farming Area; State funds; L. P. Gabbard, leader.

3. Studies of the Carrying Capacities of the Range in the Pastures of the Ranch Experiment Station; State and local funds; B. Youngblood, L. P. Gabbard, V. L. Cory, and E. M. Peters, leaders.

4. Dairy Marketing Research in Texas; cooperative funds provided by National Farm Bureau Federation; G. L. Crawford, leader.

5. Taxation Problems in Agriculture; State funds and cooperative funds provided by the Bureau of Agricultural Economics, U. S. Department of Agriculture; F. A. Buechel, leader, (in cooperation with School of Agriculture).

6. Survey and Analysis of Rural Church Conditions in Texas; cooperative with School of Agriculture; funds provided by Department of Rural Sociology of the School of Agriculture; R. C. White, leader.

7. The Cost of Producing Cotton; cooperative funds provided by the Bureau of Agricultural Economics, U. S. Department of Agriculture; R. H. Wilcox, and L. P. Gabbard, leaders.

8. Studies of Farm Mortgage Financing; Hatch and State funds; V. P. Lee, (in cooperation with Department of Agricultural Economics of the School of Agriculture), leader.

9. Hay Standardization; cooperative funds provided by the Bureau of Agricultural Economics, U. S. Department of Agriculture; in cooperation with School of Agriculture; E. O. Pollock, leader.

10. Study of Costs and Methods of Range Livestock Production and Ranch Organization in the Edwards Plateau of Texas; State funds; and cooperative funds provided by the Bureaus of Agricultural Economics and Animal Industry, U. S. Department of Agriculture; L. P. Gabbard, G. S. Klemmedson, and V. V. Parr, leaders.

11. Detailed Farm Records and Accounts in Rockwall and Collin Counties, Texas; State funds and cooperative funds provided by the Bureau of Agricultural Economics; L. P. Gabbard, and J. B. Hutson, leaders.

12. Cotton Handling and Marketing; cooperative funds provided by the Bureau of Agricultural Economics, U. S. Department of Agriculture; State funds; L. P. Gabbard, and A. B. Cox, leaders.

13. Farm Business Analysis and Settlers Progress Study in Selected Areas in Texas; State funds; cooperative funds from Bureau of Agricultural Economics, U. S. Department of Agriculture; E. O. Wooten, and L. P. Gabbard, leaders.

Agricultural Economic Survey of Crop-Farming in the Blackland Belt

The agricultural economic survey of crop-farming in the blackland belt of Texas has been completed and published as Bulletin No. 327. This study deals primarily with the economic phases or business aspects of farming. It treats specifically such questions as land classification and land utilization, land tenure, size of farm, capital investment in farms, farm labor, farm income, farm credit, and the marketing of farm products. The treatment of specific problems is prefaced by a discussion of the scope and nature of the study and a description of the area studied both as to its geographic features and its historical settlement and development.

Cost of Producing Cotton

The cooperative project on the cost of producing cotton was carried with the Bureau of Agricultural Economics, and the findings of this survey are being published by the Bureau under the title of "Cost of Producing Cotton in Fifteen Selected Areas, 1923". Three of these selected areas are in Texas, namely, Rusk, Ellis, and Lubbock Counties, where a cost of producing a pound of lint cotton was found to be 17, 13, and 10 cents, respectively. This shows an advantage of low production costs over all other areas except Johnson County, North Carolina.

Farm Mortgage Financing in Texas

The study of farm mortgage financing in Texas has been completed and the results placed in bulletin form. It represents a study of long-term credit in the State and endeavors to show the interest rate, commissions, bonuses, length of term, repayment plans, and other details of such financing.

Hay Standardization

Hay standardization studies were made possible by means of cooperation on the part of the Bureau of Agricultural Economics, U. S. Department of Agriculture, furnishing the funds, and the School of Agriculture of the College, furnishing the leader, who did the field work. Field observations were made in the important Johnson grass and prairie hay producing counties of Texas, for the purpose of securing definite information regarding the identification of various species of grasses in prairie hay and of foreign material in both Johnson grass and prairie hay, and to investigate the time of cutting, methods of caring for, storing, baling, and other factors affecting the quality and value of this hay crop in Texas. This research was followed by public hearings in various larger cities of the State on tentative grades for alfalfa, Johnson grass, and prairie grass hays, and as a result of this work the State has adopted joint State and Federal hay grades and the cities of Houston and San Antonio have employed licensed hay inspectors and graders.

Taxation Problems in Agriculture

The studies of taxation problems in agriculture have been divided into four parts. The first part of this work has been completed and a bulletin is now in course of publication on the distribution of the farmer's tax-dollar.

Costs and Methods of Range Livestock Production and Ranch Organization

Cooperative agreements for the study of costs and methods of range livestock production and ranch organization in the Edwards Plateau area of Texas became effective in September of 1924, but the field work did not begin until November. This is a triangular cooperative arrangement among the Bureaus of Agricultural Economics and Animal Industry of the U. S. Department of Agriculture, and the Station. A route-man is now in the field, and inventories have been completed on about 35 representative ranches in the area. Detailed records of costs and methods are being taken and will be assembled and the data tabulated and digested in suitable publications.

Farm Records and Accounts Studies

Detailed farm records and accounts studies are being made in Rockwall and Collin Counties, in cooperation with the Bureau of Agricultural Economics of the United States Department of Agriculture. Inventories have been completed on 23 typical farms, and maps have been made of these farms. A route-man is in the field collecting the information, and suitable tabulations and digestions of the material being gathered are being made at the Main Station.

Farm Analysis and Settlers Progress

Another cooperative study being made with the Bureau of Agricultural Economics is that of farm analysis and settlers progress in selected areas in Texas. Three men have been in the field for partial time, and 143 schedules have been filled out from owners. The results of the field work are being tabulated and a preliminary report will be available within the near future.

Carrying Capacity of the Ranges

Special emphasis is being placed on the study of the carrying capacity of the pastures on the Ranch Experiment Station, and considerable attention is being given to securing samples of the different types of vegetation for chemical analysis. At the end of another year, it is felt that the grazing observations will have supplied sufficient information to justify a report upon carrying capacity.

Dairy Marketing in Texas

The cooperative study made of dairy marketing in Texas, under arrangements of cooperation made with the National Farm Bureau Federa-

tion, has been completed. The report is now ready to be put into manuscript form, and it is expected that the information contained therein will be of general interest to the dairy industry in the State.

Survey and Analysis of Rural Church Conditions in Texas

The survey and analysis of rural church conditions in Texas, made by the Department of Rural Sociology of the School of Agriculture, cooperating with the Station, have been completed, and the data have been compiled and analyzed.

SOIL SURVEY

The Division of Soil Survey is conducted in cooperation with the Bureau of Soils of the United States Department of Agriculture, and the object of the work is the surveying and mapping of the soils of the State, by counties. During the past year the work has been confined to three important counties, namely, Hidalgo, Milam, and Nacogdoches. The value of a knowledge of soils and related agriculture is especially pronounced and immediate in the Rio Grande Valley, where rapid development is taking place and consequently much new land is being brought into cultivation and irrigation. Soil conditions in that section are different from other parts of the State. Some trouble is being had from the development of alkali conditions, and then there are varied problems in connection with irrigation, plant introduction and crop pests and plant diseases, all of which have a close relation to the soils and to the peculiar soil conditions found in that region. For these reasons, it is especially gratifying that a larger part of the Lower Rio Grande Valley has already been covered by soil surveys. The completion of Hidalgo County this year, with the finished survey of Cameron County made last year, will give a good deal of information for use in connection with scientific research and practical farming in the Valley. During the coming year, it is planned to make a detailed soil survey of Willacy County, also in the Lower Valley, so that when this survey shall have been completed, recent soil surveys will have been made of all of the Lower Valley.

In connection with the detailed soil survey of Hidalgo County, a detailed soil map and report were made of the soils of the experiment station farm, near Weslaco.

Field work was carried on in Milam County practically all the year, and the survey is practically complete. Milam County lies within a region where the blackland prairies are bordered by the sandy soils of the East Texas timber country, and therefore many kinds of soil were encountered in that county, with a wide range of material and natural characteristics, productiveness, and adaptation. Large areas have been in cultivation for years, and the problem of soil fertility is now beginning to press itself upon the people, as the deterioration of the soils becomes more pronounced in certain sections. Economic questions are also involved, as is the case in many other counties where cotton is practically the one cash crop. It is felt that the soil survey of Milam County will furnish information which

will give a basis for valuable studies of rural problems, especially with reference to fertilization, soil renovation, and plant food conservation; crop adaptations, and economic policies dealing with a more satisfactory cropping system.

The field work in Nacogdoches County is practically complete. This county is one of the most representative counties of East Texas, where soil studies are especially needed in supplying information for the use of farmers in maintaining the fertility of the land and in considering the introduction of new crops or superior strains and varieties of crops, soil engineering, and other related problems.

In connection with the soil survey of this county, a detailed soil map and a soil report were made of Substation No. 11, located in this area.

During the year, the soil survey work done by the Division amounted to more than two thousand square miles in the three areas under survey.

BOTANY

Much of the time of the Division of Botany has been taken up in the mounting and identifying of specimens contained in the herbarium. A large number of specimens are being added to the herbarium from time to time, by the Grazing Research Botanist at the Ranch Station, and from the Loin Disease Field Laboratory in Harris County.

In cooperation with the Division of Farm and Ranch Economics in connection with the agricultural surveys being made in Rockwall County, a survey of the vegetation of that area was made by the Division of Botany, and at present the plan is to make a similar survey of the Loin Disease Field Laboratory.

POULTRY HUSBANDRY

Projects:

1. Breeding as Affecting Egg Production; State and local funds; R. M. Sherwood, leader.
2. Comparison of the Value of Protein from Vegetable Sources with Protein from Animal Sources; State and local funds; R. M. Sherwood, leader.
3. Comparison of Various Texas Feeding Stuffs for Young Chickens; State and local funds; R. M. Sherwood, leader.
4. Studies of Variation in Hatching Quality of Eggs; State and local funds; R. M. Sherwood, leader.

Poultry Breeding as Affecting Egg Production

The study of poultry breeding as affecting egg production is divided into two parts: (1) a study of the improvement of egg production and the size of eggs of common farm chickens by the use of the well-bred males, and (2) a study to determine, by tests of their progeny, the capability of certain cockerels to transmit high egg production. Cockerels that prove to be high producers are in turn mated carefully, in order to build up the

quality of the Station's strain of White Leghorns. Considerable information has been gathered on the correlation between body characters and egg production, and this material will be carefully analyzed and submitted for publication.

Comparative Values of Protein from Vegetable Sources and Animal Sources

Studies of the comparative values of protein from vegetable sources and animal sources have been carried for five years. The information so far indicates that cottonseed meal may be fed to laying hens with good results, though the results vary slightly from year to year, possibly due to seasonal variations in cottonseed meal. The work the past year showed an average egg production for the cottonseed meal lot of 123 eggs per hen for a period of eleven months, while the lot receiving meat scrap ration had an average egg production of 147 eggs per hen. The feed consumed in the case of the hens receiving cottonseed meal amounted to 5.8 pounds per dozen eggs produced, as compared with 5.5 pounds per dozen eggs for the lot receiving the meat scrap ration.

Comparison of Various Feeds for Young Chickens

The object of the work the past year in the comparison of various feeds for young chicks was to determine whether the beneficial results of buttermilk in the control of cocciodiosis is due to lactic acid, to the greater amount of protein provided, or to the quality of the protein. Ten lots of chickens were used in the experiment, and they were fed upon a ration of yellow corn meal, bone-meal, oyster shell, and salt. The results showed that one per cent of lactic acid in the drinking water was of no value in reducing losses. In fact, the losses were greater in all cases wherein lactic acid was used, than in cases where no lactic acid was used. The chickens receiving the lactic acid did not grow as rapidly as those not receiving it. Various additions were made to the rations for the various lots of chickens used, but those fowls which received the most skim-milk and one-third buttermilk made the most rapid gains and had a low mortality.

Variation in Hatching Quality of Eggs

The studies of variations in hatching quality of eggs have been under way for two years. During the past year data were secured from 65 individual hens and 32 different flocks. From the individual hens, 988 eggs showed marked difference in their hatchability, ranging from nothing up to 100 per cent. Of the 50,024 eggs hatched from the 32 different flocks, the range of hatchability of total eggs set was from 22.2 to 74 per cent, with an average of 65.3 per cent. Seasonal conditions and flock management proved to exert a marked influence upon hatches. Eggs shipped from a distance did not hatch as well as local eggs.

SWINE HUSBANDRY

Projects:

1. Cottonseed Meal for Maintaining, Growing, and Fattening Hogs; State and local funds: G. R. Warren, succeeded by Fred Hale, leader.
2. The Effect of Adding Various Minerals to a Fattening Ration for Hogs; State and Hatch and local funds; Fred Hale, leader.

Cottonseed Meal for Swine

The study of cottonseed meal for maintaining, growing, and fattening hogs is designed to determine whether cottonseed meal (choice), when fed in amounts sufficient to balance the ration, may be safely fed to brood sows during their gestation and lactation periods, and to growing and fattening hogs. The sows used in these experiments were fed a ration consisting of six parts by weight of milo chops and one part of choice cottonseed meal, being placed on this ration the day they were bred and kept on it constantly. In September they farrowed pigs and suckled them, though the litters were small. All pigs were kept constantly on this cottonseed meal ration, after weaning, while both the sows and the pigs were allowed to run on Sudan grass pasture. In February, the pigs were divided into uniform lots and put on a 60-day fattening test, and hand-fed in a dry lot. The rations consisted of milo (ground) six parts, by weight, and cottonseed meal one part for lot 1, while lot 2 was fed on a ration of nine parts of ground milo and one part, by weight, of 60-per cent-protein tankage. The ration was fed as a thick slop, morning and evening. The initial weight of these pigs when they were put on feed was 97 pounds each, while the average weight at the close of the feeding period was 188 pounds for lot 1 and 200 pounds for lot 2. Lot 1, receiving the cottonseed meal and milo ration, made an average daily gain of 1.08 pounds, while lot 2, receiving milo and tankage, made an average daily gain of 1.51 pounds. The pigs in lot 1 required 359.6 pounds of feed for 100 pounds of gain, while the pigs in lot 2 required 318 pounds of feed per 100 pounds of gain. The pigs in the cottonseed meal lot were healthy in every respect, but were not as well finished as those of lot 2. In March the three sows on this cottonseed meal ration all farrowed litters of pigs, and the average birth-weight of the pigs was 2.91 pounds. They were normal in every respect and grew very fast during the suckling period, while their mothers were still on the cottonseed meal ration. The pigs were weaned when they were 70 days old, and at that time averaged 47 pounds in weight. These pigs were fed twice daily on the ration of six parts of milo and one part of cottonseed meal, in a thick slop, and had access to green pasture all the time. In July, ten of these pigs were placed in a dry lot and were fed twice daily on the ration of milo and cottonseed meal for a period of 70 days. When placed in the dry lot, the average weight of the pigs was 88 pounds. At the close of the fiscal year, the pigs had been on feed for 50 days, and were gaining at the rate of 1.15 pounds per head per day. Two gilts were selected from this second farrowing, and will be developed, bred, and will farrow on the cottonseed

meal ration, in a manner similar to the way their dams were handled. One boar pig was saved out of this lot of pigs, will be developed on the cottonseed meal ration, and later bred to the cottonseed meal gilts. These studies will supply information as to the efficiency of cottonseed meal in the development of breeding stock, and will also show the effect of cottonseed meal on the offspring of animals which have been developed on this ration.

Effect of Minerals in Swine Rations

A study of the effect of adding various minerals to a fattening ration for hogs had as its object the determination of the effect of such minerals with reference to rate of gain and amount of feed required per unit of gain by feeder pigs. The test was made with 60 uniform Duroc-Jersey pigs weighing 100 pounds each, and they were fed for 60 days. Lot 1 received a ration of nine parts of milo and one part of tankage, and lot 2 received a similar ration with the addition of one per cent of sodium chloride, while lot 3 received an addition of one per cent of a mineral mixture composed of equal parts of hardwood ashes, salt, and air-slaked lime. All lots were fed twice daily in a dry lot, and the rations were given in the form of thick slop. The average daily gains, the total gains, and the average final weights were so close as to furnish little significance to any one lot, and there was very little difference in the amount of feed consumed by the three lots. The tankage used contained 20.96 per cent ash, and the minerals added to this milo and tankage ration did not increase the rate of gain, and did not decrease the amount of feed required per unit of gain.

DAIRY HUSBANDRY

Projects:

1. Constructive Breeding of Dairy Cattle; in cooperation with Department of Dairy Husbandry of the School of Agriculture; G. P. Grout, and J. L. Lush, leaders.

Constructive Breeding of Dairy Cattle

The object of the constructive breeding of dairy cattle being carried in cooperation with the Department of Dairy Husbandry of the School of Agriculture, is to improve both the College and the Station dairy herds in production, constitution, size, type, and color of animals, and to learn whether there is any difference between families in resistance to infectious abortion; to study the inheritance and general behavior of these characteristics. The results during the past year have convinced the project leaders that the Hood Farm bull used by the Station was an inferior animal and he was accordingly sold. Three other lines of breeding were tested out, and none of them proved entirely satisfactory. Further attempts will be made to find a thoroughly satisfactory herd bull. The work to date has clearly demonstrated that the raising of young heifers is an expensive proposition under present conditions, and that one cannot make a financial success of it unless he is using an especially good bull. It has been noted that not all registered bulls are good, and that even bulls with famous ancestors not

more than two or three generations back in their pedigrees, may prove to be incapable of improving an ordinary herd. Thus the Hood Farm bull had for his sire one of the most noted Jersey bulls in America, and yet half of his daughters have not been good enough milk producers to pay the expense of raising them to maturity. The results of this study so far make a tremendous argument in favor of the progeny test, and very clearly show that much of the propaganda in favor of purebred sires is too sanguine, and that it is a serious mistake to assure a farmer that by merely using purebred sires and culling his cows, he can invariably produce a herd which will have a high average of production. The problem of selecting a good bull is one of the most serious of the dairy breeding field, and any additional refinement in the method of selecting bulls will be a very useful addition to the present knowledge.

PUBLICATIONS

The activities of the Division of Publications during the past year consisted of the operation of the mailing room and the mailing out of the official publications, and the preparation of bulletins, circulars, and newspaper articles relating to the work of the Station System, the listing of library accessions and sending notices of such accessions to the staff members.

Press bulletins to the number of 31, each with an edition of 3200 copies, have been prepared and sent out to the press of the State, the bankers, the Extension, teaching and Station staffs, and to individuals. The press bulletins were freely used by the papers of the State, many of the papers using practically all of them. In the commonly accepted sense of the term, the Station has not sent out any "publicity" during the year. Information has been supplied to newspaper correspondents, editors, and feature writers, upon their request, and so anxious were they to get this material that it has been the rule, rather than the exception, that this information has been printed in the same form that it was submitted by the Station.

The work of editing and preparing the various publications of the Station for the printer has been much more efficient during the year than in the past, by the enthusiastic cooperation of the members of the staff who have examined all manuscripts and offered constructive criticism of the material submitted.

A set of rules and regulations for the preparation of manuscripts and for uniform style in printing, were formulated and distributed to the staff members during the year, and the effect of these rules and regulations may already be noted in the bulletins, circulars and reports printed.

Publications Issued

The following is a tabular statement of the 19 bulletins, three circulars, and two annual reports sent to the printer during the year:

Number and Title	Pages	Number Copies in Edition	Total Number of Pages in Edition
TOTAL	1,223	214,000	10,624,500
Bulletin No. 315, Digestive Experiments with Oat By-Products and Other Feeds	12	6,000	72,000
No. 316, The Soils of Brazos, Camp, Ellis, and Washington Counties	88	8,000	704,000
No. 317, Comparative Influences of Various Protein Feeds on Laying Hens	24	15,000	360,000
No. 318, The Relation Between Rents and Agricultural Land Values in Theory and in Practice	71	10,000	710,000
No. 319, Field and Laboratory Notes on a Fatal Disease of Cattle Occurring on the Costal Plains of Texas (Loin Disease)	32	10,000	320,000
No. 320, The Influence of Individuality, Age and Season upon the Weights of Fleeces Produced by Angora Goats under Range Conditions	54	10,000	540,000
No. 321, Cotton Variety Experiments at the Main Station, 1912 to 1922	22	12,000	264,000
No. 322, Commercial Fertilizers in 1923-24	63	6,500	409,500
No. 323, The Price of Feed Utilities	24	6,000	144,000
No. 324, Commercial Feeding Stuffs: September 1, 1923, to August 31, 1924	157	8,000	1,256,000
No. 325, Effect of Cropping upon the Active Potash of the Soil	20	5,000	100,000
No. 326, Breeding Experiments with Blackberries and Raspberries	30	5,000	150,000
No. 327, An Agricultural Economic Survey of Rockwall County, Texas, A Typical Blackland Cotton Farming Area	161	9,000	1,449,000
No. 328, Life-History of the Pecan Nut Case-Bearer	150*	10,000	1,500,000*
No. 329, Energy-Production Coefficients of American Feeding Stuffs	62	6,500	403,000
No. 330, Farm Mortgage Financing in Texas	67	9,000	603,000
No. 331, The Value of Various Feeds in the Control of Coccidiosis in Chicks	16	15,000	240,000
No. 332, Biometrical Studies of Lint and Seed Characters in Cotton	19	10,000	190,000
No. 333, Heritable Chlorophyll Deficiencies in Seedling Cotton	22	6,000	132,000
Circulars:			
No. 34, The Lower Rio Grande Valley of Texas	15	10,000	150,000
No. 35, Suggestions on Queen Rearing	19	15,000	285,000
No. 36, I. Foulbrood Control and Diseases of Bees. II. Foulbrood Law and Revised Regulations	24	12,000	288,000
Annual Reports:			
36th for 1923	31	5,000	155,000
37th for 1924	40*	5,000	200,000*

*Paging estimated because printed job not yet delivered by printers.

Contributions

In addition to the research bulletins and circulars printed by the Station the workers have prepared and submitted for publication in scientific journals and periodicals and the press, 59 contributions on various subjects coming within the field of their investigations. A list of these contributions is as follows:

No.

162..Bee Behavior the Basis for Beekeeping Practices; H. B. Parks, Apiculturist; the Beekeepers Item.

163..The State Queen-rearing Yard; H. B. Parks, Apiculturist; written for E. A. Burgess, special writer, whose article in The Country Gentleman flooded the Queen-yard with orders for queens.

164..The Need for a Pecan Experiment Station; B. Youngblood, Director; address before 1924 annual convention of Texas Pecan Growers Association.

165..A Texas Rambouillet Sheep Breeder's Banquet; J. M. Jones, Chief, Division of Range Animal Husbandry; Texas Sheep and Goat Raisers Magazine.

166..A Grandson of Ben Hur; A Famous Rambouillet Sire and Show Ram; J. M. Jones, Chief, Division of Range Animal Husbandry; Texas Sheep and Goat Raisers Magazine.

167..Historical Development of Ranching; B. Youngblood, Director; The Progressive Farmer.

168..The Type of Calves Essential for Baby Beef; J. M. Jones, Chief, Division of Range Animal Husbandry; prepared for Extension Service's better beef campaign; published in The Cattleman; Farm and Ranch; and Market Growers Journal.

169..Some Suggestions for Controlling the Cotton Flea; F. L. Thomas, Chief, Division of Entomology; State press.

170..Effects of Dehorning; J. L. Lush, Animal Husbandman, Breeding Investigations; The Cattleman.

171..Some Suggestions for Controlling the Cotton Flea; F. L. Thomas, Chief, Division of Entomology; The Progressive Farmer.

172..White-Brush; H. B. Parks, Apiculturist; The Beekeepers Item.

173..Experiment Station Work; H. B. Parks, Apiculturist; The Beekeepers Item.

174..Texas Root Rot of Cotton and How to Control It; J. J. Taubenhaus, Chief, Division of Plant Pathology and Physiology; The Acco Press.

175..Nature's Scorecard for Feeder Steers; J. L. Lush, Animal Husbandman, Breeding Investigations; 1924 proceedings American Society of Animal Production.

176..Rambouillet Breeders Remove Telegony Rule; J. L. Lush, Animal Husbandman, Animal Breeding Investigations; National Wool Growers Magazine.

177..Soil Fertility; E. B. Reynolds, Chief, Division of Agronomy; The Progressive Farmer.

178..Livestock Investigations of the Texas Station; J. M. Jones, Chief, Division of Range Animal Husbandry; The Daily Drovers Telegram.

179..Notes on Honey Plants; H. B. Parks, Apiculturist; The Beekeepers Item.

180..The Division of Entomology of the Station: How It Serves the State; F. L. Thomas, Chief, Division of Entomology; Radio address, broadcasted from College Station.

181..The Effect of Rotation on the Yield of Cotton; E. B. Reynolds, Chief, Division of Agronomy; The Acco Press.

182..Cotton in West Texas; A. B. Conner, Vice-Director; Amarillo News, Wichita Daily Times, Dallas News, Fort Worth Star-Telegram, Fort Worth Record, Farm and Ranch, The Progressive Farmer, El Paso Daily Times.

183..Why Purebred Sires; J. L. Lush, Animal Husbandman, Breeding Investigations.

184..Some Important Things That the Texas Station is Doing for Texas Ranchmen and Stockmen; J. M. Jones, Chief, Division of Range Animal Husbandry; The Cattleman.

185..Insuring a More Profitable Tomato Crop; J. J. Taubenhaus, Chief, Division of Plant Pathology and Physiology; The I.-G. N. Farmer.

186..The Relations of Grazing to our Racial Development; B. Youngblood, Director; The Progressive Farmer.

187..A Letter to Cattlemen; B. Youngblood, Director; The Cattleman.

188..Cotton in Northwest Texas; A. B. Conner, Vice-Director; The Acco Press.

189..The Value of Cultural Measures in the Control of Insect Pests; F. L. Thomas, Chief, Division of Entomology; Radio talk broadcasted from College Station.

190..Some Fundamental Principles in Planting Crops Under West Texas Conditions; A. B. Conner, Vice-Director; The Progressive Farmer.

191..Management of Range Ewes During Periods of Drouth; J. M. Jones, Chief, Division of Range Animal Husbandry; San Angelo Standard, and Sheep and Goat Raisers Magazine.

192..Bee Behavior in Swarm Control; H. B. Parks, Apiculturist; The Beekeepers Item.

193..Grain Sorghum and the Importance of Growing Proved Varieties; A. B. Conner, Vice-Director; The Progressive Farmer.

194..Schedule for Reducing Tomato Diseases in East Texas; J. J. Taubenhaus, Chief, Division of Plant Pathology.

195..Preparing and Marketing the Texas Wool Clip; J. M. Jones, Chief, Division of Range Animal Husbandry; The Progressive Farmer.

196..Critical Temperatures; H. B. Parks, Apiculturist; organ of The Texas Honey Producers Association.

197..The Purnell Bill and Its Significance to Woman; B. Youngblood, Director; Home Economics Newsletter of Board for Vocational Training, Austin.

198..Grasshopper Control; F. L. Thomas, Chief, Division of Entomology; The Bryan Daily Eagle.

199..The Relation of Plant Diseases to Delay in Transit; J. J. Taubenhaus, Chief, Division of Plant Pathology and Physiology.

200..Texas Farmers and Stockmen Believe in Scientific Research as a Means to Progress; B. Youngblood, Director; the press of Texas.

201..The Word, 'Ammonia', G. S. Fraps, Chief, Division of Chemistry; The Commercial Fertilizer.

202..Sulphur as an Insecticide and Fungicide; G. S. Fraps, Chief, Division of Chemistry; The Bryan Daily Eagle.

203..The Montana Survey; B. Youngblood, Director; The Bryan Daily Eagle.

204..A New Foot-rot of the Sweet Potato; J. J. Taubenhaus, Chief, Division of Plant Pathology and Physiology; Phytopathology.

205..Living Among the Farmers and Ranchmen in the Northern Great Plains; B. Youngblood, Director; The Bryan Daily Eagle.

206..Visiting the Upper End of the Old Texas Trails; B. Youngblood, Director; The Bryan Daily Eagle.

207..The Cotton Industry in Texas; L. P. Gabbard, Chief, Division of Farm and Ranch Economics; The Manchester (N.Y.) Guardian.

208..My Trip to the Badlands; B. Youngblood, Director; The Bryan Daily Eagle.

209..Windmill Irrigation for West Texas; A. B. Conner, Vice-Director; The Progressive Farmer.

210..The Badlands; B. Youngblood, Director; The Bryan Daily Eagle.

211..Finishing Up the Story of the Badlands; B. Youngblood, Director; The Bryan Daily Eagle.

212..A Visit to the Northern Great Plains Region; B. Youngblood, Director; The Progressive Farmer.

213..Practical Methods of Estimating the Proportion of Fat and Bone in Cattle Which Are Slaughtered in Commercial Packing Plants; J. L. Lush, Animal Husbandman, Breeding Investigations; Journal of Agricultural Research.

214..Living Among the Farmers and Ranchmen in the Northern Great Plains; B. Youngblood, Director; The Progressive Farmer.

215..Visiting the Upper End of the Old Texas Trails; B. Youngblood, Director; The Progressive Farmer.

216..Trip to the Badlands; B. Youngblood, Director; The Progressive Farmer.

217..The Badlands (continued); B. Youngblood, Director; The Progressive Farmer.

218..Finishing Up the Story of the Badlands; B. Youngblood, Director; The Progressive Farmer.

219..Aluminum Combs for Bees; H. B. Parks, Apiculturist; The Beekeepers Item.

220..Report Covering the First Year's Investigations of the Cooperative Project on the Feeding and Killing Qualities of Hereford, Hereford-Brahma, Shorthorn, and Shorthorn-Brahma Steers on the King Ranch, J. L. Lush, and W. H. Black; mimeographed report of work for Department and Station use.

The mailing list of the Station at this time contains a total of 72,103 names, and shows a net increase during the past year of 360 names, although more than 1200 names were removed from the various lists during the period.

There were 1810 scientific publications received by the Station library during the year. These were catalogued and reports sent to members of the staff, giving special notice of the features of such accessions to the library.

FEED CONTROL SERVICE

The Division of Feed Control Service is the agency of the Station organization through which the Director carries out the provisions of the State pure feed law. During the past year, the same thorough system of inspection has been maintained as during former years, and feed inspectors have visited feed manufacturers, feed dealers, and a large number of customers, in order to secure official samples for analysis, to weigh packages of feeding stuffs to prevent selling short-weight feeds, and to detect other possible violations of the feed law. Feed inspectors file weekly route-lists with the Chief of the Division, and these are revised by him whenever necessary. In addition, each inspector is required to submit a daily report of his activities. During the past year, feed inspectors on official duty traveled 67,543 miles, and visited 9,069 firms in 1,680 towns and cities, and secured 1,518 official samples of feeding stuffs which were subjected to chemical analysis, and analyses were also made of 378 registration samples and 50 special samples, making a total of 1,946 analyses made during the year. The cooperation with the Bureau of Chemistry, United States Department of Agriculture, has been continued, under which have been drawn and reported to the Federal authorities, 10 samples of feeding stuffs, representing shipments made in violation of the Federal Food and Drugs Act of 1906.

Results of the inspection of feeds are reported to the manufacturer, the dealer, and the consumer, in order that all parties interested may know to what extent the feed law is being obeyed. When the analysis of a shipment shows it to be adulterated or misbranded, the dealer is notified, and advised to remove the feed from sale, and failure to follow instructions leaves no option except to file legal proceedings for violation of the feed law.

During the year, dealers have been advised to remove from sale 400 shipments of feed, manufactured by 185 different firms, and amounting to 2,180,700 pounds, for the reason that the feeding stuffs involved did not

meet the requirements of the law. Untagged shipments were properly labeled; improperly tagged shipments were relabeled; and the sales of feeding stuffs below guarantee were adjusted by the manufacturers paying proper rebates to dealers and consumers when the deficiencies were sufficient to warrant such rebates. Nine complaints were filed, six of which are still pending in the courts. One case of counterfeiting tax tags was settled by the defendant entering a plea of guilty and paying a fine of one hundred dollars and costs. Another case in which the charge was selling cottonseed meal deficient in feeding value, resulted in a plea of guilty and a fine of two hundred dollars and costs, and in another case, on a charge of selling cottonseed meal deficient in protein, the defendant pleaded guilty and paid a fine of one hundred dollars and costs.

Representatives of the Division have attended conventions of the Association of Official Agricultural Chemists of North America; the Association of Feed Control Officials of the United States; the Association of Food, Feed, and Drug Officials of the South Central States; and the Texas Cotton Seed Crushers Association. The Chief of the Division has acted for the Association of Feed Control Officials of the United States, as a member of the Committee on Definitions and Standards for Wheat Mill Feeds, and also on the Committee on Cottonseed Products.

Following the usual custom, two semi-annual conferences of feed inspectors with the Division officers have been held. The September, 1924, conference was held at College Station, and the April, 1925, conference at Waco.

STATION LANDS

The following table shows the lands owned and operated by the Agricultural Experiment Station System of the Agricultural and Mechanical College of Texas, for agricultural research purposes:

Designation	Acres of Land Devoted to Various Uses			
	Area	Cultivation	Pasture	Farmstead, Roadways, and Miscellaneous
TOTAL	7,595.895	1,407.6	6,012.095	176.2
Main Station Farm	*127	98	11	18
Division of Veterinary Science	*141	5	130	6
State Apicultural Research Laboratory, San Antonio, Bexar County	10	6	1	3
Loin Disease Field Laboratory, Bammel, Harris County	**879.4	0	877.4	2
Substation No. 1, Beeville	151.5	63.2	84.3	4
2, Troup	150	50	90	10
3, Angleton	157	51	100	6
4, Beaumont	100	60	30	10
5, Temple	96	37	55	4
6, Denton	209.92	163	34.92	12
7, Spur	406.35	104	292.35	10
8, Lubbock	160	109	41	10
9, Balmorhea	200	68	120	12
10, College Station	***901.8	212	674.8	15
11, Nacogdoches	82.5	33.4	38.9	10.2
12, Chillicothe	100	80	10	10
14, Sonora	3,461.63	65	3,376.63	20
15, Weslaco	100	95	3	2
16, Iowa Park	161.795	108	41.795	12

*Included in the main tract of College land.
**Leased land.
***Includes 636 acres of the College's main tract and 265.8 acres purchased later for research purposes.

SUBSTATIONS

A considerable number of the activities of the Station System are devoted on the lines of investigations and research conducted on one, several, or all of the 20 locations in various parts of the State where continuous, systematic work is under way. These field locations are permanent substations in 15 cases, and had their origin in the fact that field experiments conducted at the Main Station would not yield definite information applicable to every part of the State. Much of the work conducted at these outlying points is original and fundamental research, which, because of climatic or soil factors, cannot be prosecuted at the Main Station. Other work of the substations, however, is devoted to a testing out of the current results produced by the scientific staff of the Station System, in the attempt to make practical use, in each of the several locations, of work which has had its origin in the technical laboratories at the Main Station.

Attention is specifically directed to the fact that these outlying field locations are outdoor laboratories wherein accurate, definite, detailed records of experiments are secured.

Each of the substations carries one or more specific responsibilities in addition to its function as a definite unit for the regional testing out of the findings of the Main Station. The particular lines of work most stressed on each one of the substations are as follows:

Substation No. 1, Beeville: Investigations with hardy citrus fruits and dry-farming agronomic investigations.

Substation No. 2, Troup: East Texas fruit and vegetable crops, together with horticultural and field crop soil fertility investigations.

Substation No. 3, Angleton: Crop production on the Gulf Coast Plain, including studies of forage crops, grasses, legumes and fruits, as well as drainage investigations.

Substation No. 4, Beaumont: Rice and rice farming, together with the supplemental crops, irrigation, drainage, and fruit industries, which must go with rice farming.

Substation No. 5, Temple: Cotton breeding and improvement, cotton diseases, particularly cotton root rot, and all crops needed in a rotation with cotton, as well as fertilizers, drainage and fruit problems for Central Texas.

Substation No. 6, Denton: All crops adapted to the heavy soils of the black prairies, with particular emphasis on small grain, rotation and fertilizers.

Substation No. 7, Spur: The grain and forage sorghums of the broken region east of the High Plains, but including also cotton and other crops, and experiments on the utilization of the locally produced feed crops, including feeding experiments with cattle and sheep.

Substation No. 8, Lubbock: Suitable crops and methods of crop production on the High Plains, including fundamental research in the improvement of sorghums and cotton, together with studies in soil fertility, dry-farming, and supplemental irrigation.

Substation No. 9, Balmorhea: Irrigation farming in Southwest Texas.

Substation No. 10, College Station: Studies in the feeding, breeding and management of livestock, with particular reference to those types of work which will have Statewide value.

Substation No. 11, Nacogdoches: The development of a profitable system of crop production and soil management in East Texas, including fertilizer investigations and specific inheritance studies in peanuts.

Substation No. 12, Chillicothe: This is a forage crop testing farm, specifically devoting a large amount of its attention to the trying out and development of new forage crops, but including supplemental work with farm crops and farm practices.

Substation No. 14, Sonora: A study of ranch animal husbandry and ranch management, with sheep, goats and cattle, as well as studies of veterinary problems related to the livestock industry.

Substation No. 15, the Lower Rio Grande Valley Citrus Fruit Experiment Station, Weslaco: This station was established primarily for investigations with citrus fruits, including the testing and improving of stock, and the study of methods of controlling insects and diseases common to citrus fruits. A subsidiary line of work deals with studies of vegetable production in all its phases. The growing of both citrus fruits and vegetables will also be considered in connection with general farm crops which are necessary to the best operation of such specialized types of farming.

Substation No. 16, the Wichita Valley Irrigation Experiment Station, Iowa Park: This station was established for the investigation of problems connected with irrigation farming in the Wichita Valley region. These problems embrace the proper uses of water and the suitability of various general farm, truck, and fruit crops for the region.

The Loin Disease Research Field Laboratory, near Bammel, Harris County, is located on a ranch of 879.4 acres in the heart of the territory where this cattle disease is prevalent, and is exclusively for the study of this disease.

The other outlying laboratories, four in number, are all specifically concerned with fundamental studies relating to the bee and honey industry of Texas, in locations differing essentially in their suitability for certain lines of this work.

COOPERATION

In accordance with the long-established policy of the Texas Station to cooperate wherever cooperation may be mutually desirable, formal agreements providing for cooperative research have been entered into or continued during the year as follows:

1. Office of Forage Crops, Bureau of Plant Industry, United States Department of Agriculture, in the operation of Substation No. 12, Chillicothe, Texas, and in general forage crops investigations throughout the State.

2. Office of Foreign Seed and Plant Introduction, Bureau of Plant Industry, United States Department of Agriculture, for the introduction, propagation, and distribution of newly introduced plants giving promise of becoming valuable in Texas.

3. Office of Cotton and Truck-Disease and Sugar-Plant Investigations, Bureau of Plant Industry, United States Department of Agriculture, for an annual plant disease survey in Texas and for a general study of plant diseases.

4. Bureau of Soils, United States Department of Agriculture, for the conduct of soil survey work in Texas.
5. Bureau of Entomology, United States Department of Agriculture, for cooperative investigations of insects and parasites affecting livestock.

5. Bureau of Entomology, United States Department of Agriculture, for cooperative investigations of insects and parasites affecting livestock.

6. Bureau of Animal Industry, United States Department of Agriculture, for investigations as to the adaptability of Corriedale sheep to Texas conditions and for the study of soft pork problems.

7. Bureau of Agricultural Economics, United States Department of Agriculture, for studies of farmer's and ranchmen's business organizations and in making an agricultural economic survey of a typical crop-farming area in the blacklands of Texas.

8. Freeport Sulphur Company for studies of the value of sulphur for Texas soils and crops.

9. The Barrett Company of Texas, for cooperative investigations in rice improvement and methods of production.

10. School of Agriculture, Agricultural and Mechanical College of Texas, wherein Station men may give lectures to students and teachers may do cooperative investigation work for the Station.

11. School of Veterinary Medicine, Agricultural and Mechanical College of Texas, whereby the Dean of the School of Veterinary Medicine acts as Chief of the Division of Veterinary Science for the Station.

12. School of Engineering, Agricultural and Mechanical College of Texas, wherein certain professors may cooperate with the Station workers in agricultural studies involving engineering problems.

13. Extension Service, Agricultural and Mechanical College of Texas, whereby Extension workers from time to time suggest the more important problems confronting Texas farmers and stockmen and certain Extension specialists cooperate with the Station in making certain investigations mutually agreed upon.

14. Williamson County Belton Cotton Seed Growers Association of Granger, Texas, for the increase and distribution of seed of pure Belton cotton.

15. Texas State Live Stock Sanitary Commission, in studies of the sheep scab mite at the Ranch Experiment Station.

16. Western Weighing and Inspection Bureau of Dallas, wherein the railroads of the State and Southwest furnish a fund for the conduct of research and investigations of the various transit and storage diseases affecting fruits, vegetables, and other field crops.

FINANCIAL STATEMENT

A detailed statement of all funds devoted to the Texas Agricultural Experiment Station System is given in the pages immediately following. The fiscal year for the State appropriations is for the period from September 1, 1924, to August 31, 1925, while the fiscal year for the Federal Hatch and Adams funds is for the period from July 1, 1924, to June 30, 1925, and the financial schedules which follow are based upon these designations.

College Station, Texas,
December 23, 1925.

Director B. Youngblood,
Texas Agricultural Experiment Station System.
Dear Sir:

I do hereby certify that to the best of my knowledge and belief the following report upon the receipts and disbursements of the several funds devoted to the development, maintenance and support of the Texas Agricultural Experiment Station System correctly reflects the official accounts for the fiscal year ending August 31, 1925.

(Signed) W. H. Holzmann,
Chief Clerk (Bonded).

Subscribed and sworn to before me, A. S. Ware, Notary Public in and for Brazos County, Texas, on the 23rd day of December, A. D., 1925.

(Signed) A. S. Ware,
Notary Public in and for
Brazos County, Texas.

(Seal)

FUNDS AVAILABLE

TOTAL	$466,782.01
HATCH FUND, from United States Treasurer for the year ending June 30, 1925	$ 15,000.00
ADAMS FUND, from United States Treasurer for the year ending June 30, 1925	15,000.00
MAIN STATION, from State Treasurer for the year ending August 31, 1925	133,000.00
SUBSTATIONS, from State Treasurer, (unexpended balance in establishment fund) Lower Rio Grande Valley Station	16,685.66
SUBSTATIONS, from State Treasurer for the year ending August 31, 1925	84,000.00
MAIN STATION TREASURY, from sale of products for the year ending August 31, 1925, including balance brought forward	26,514.24
SUBSTATION TREASURY, from sale of products for the year ending August 31, 1925, including balance brought forward	71,091.68
SULPHUR FUND, from Freeport Sulphur Company, for the year ending August 31, 1925, including balance brought forward	3,916.21
FEED CONTROL SERVICE, from Sale of Tags, for year ending August 31, 1925	101,574.22

CLASSIFICATION OF EXPENDITURES

TOTAL		$466,782.01
Salaries	$178,883.29	
Labor	52,645.46	
Postage, stationery, and office supplies	9,492.56	
Scientific supplies (consumable)	5,968.66	
Feedingstuffs	24,314.23	
Sundry Supplies	3,801.00	
Fertilizers	510.12	
Travel expense	20,155.95	
Freight and express	3,494.24	
Publications	5,915.23	
Heat, light, water, and power	4,976.53	
Furniture, fixtures, and furnishings	2,545.75	
Library	331.30	
Scientific equipment	1,018.29	
Livestock	6,504.56	
Farm machinery, tools, and implements and repairs thereon	16,584.55	
Buildings and building repairs	34,396.77	
Refunds on feed tax tags redeemed	843.00	
Chemical analyses	12,000.00	
Feed tags purchased	11,934.37	
Loin disease of cattle	1,804.14	
Foulbrood eradication	9,890.35	
Contingent expenses	1,759.00	
Feed Control surplus remitted to Treasurer of College	40,917.38	
Unexpended balance (as of August 31, 1925)	16,095.28	

ANALYSIS OF UNEXPENDED BALANCE OF AUGUST 31, 1925

TOTAL		$16,095.28
Main Station appropriation		$2,358.51
Substation appropriation		888.74
Lower Rio Grande Valley Station (estab. fund)	$ 8.76	
All other substations (current appropriations)	379.98	
Main Station Sales Fund		3,511.43
Ten Per Cent Account	296.64	
Balance from previous year	3,214.79	
Substation Sales Fund		7,238.10
Balance from previous year	7,534.74	
Less amount due Ten Per Cent Account	296.64	
Net amount of this item	$7,238.10	
Sulphur Fund		2,598.50

FEDERAL FUNDS

TOTAL $30,000.00

HATCH FUND

Items	Debit	Credit
Total	$ 15,000.00	$ 15,000.00
Received from Treasurer of the United States	15,000.00	
Salaries		12,174.88
Labor		1,209.97
Stationery and office supplies		268.35
Feedingstuffs		325.49
Communication service		26.63
Furniture, furnishings, and fixtures		300.00
Library		24.10
Scientific equipment		50.00
Livestock		548.86
Tools, machinery, and appliances		31.40
Repairs and buildings		40.32

ADAMS FUND

Items	Debit	Credit
Total	$ 15,000.00	$ 15,000.00
Received from the Treasurer of the United States	15,000.00	
Salaries		13,344.84
Labor		827.31
Stationery and office supplies		58.08
Scientific supplies (consumable)		406.26
Sundry supplies		45.57
Scientific equipment		5.65
Transportation		16.10
Livestock		100.00
Tools, machinery, and appliances		142.38
Repairs and buildings		51.81

STATE APPROPRIATIONS

MAIN STATION

Division	Debit	Credit
Total	$133,000.00	$133,000.00
Received from the State Treasurer	133,000.00	
Salaries		68,058.66
General Expenses		8,064.41
Veterinary Science		6,500.00
Horticulture		1,677.85
Range Animal Husbandry		4,877.10
Entomology		12,390.87
State Apicultural Research Laboratory		6,497.60
Agronomy		2,478.59
Main Station Farm		3,996.62
Plant Pathology and Physiology		1,479.48
Soil Survey		6,998.46
Farm and Ranch Economics		1,600.00
Botany		394.30
Publications		3,614.15
Dairy Husbandry		601.99
Swine Husbandry		1,026.45
Poultry Husbandry		384.96
Balance unexpended (vouchers pending)		2,358.51

SUBSTATIONS

Lower Rio Grande Valley Station Establishment Appropriation

	Debit	Credit
Total	$ 16,685.66	$ 16,685.66
Received from the State Treasurer	16,685.66	
Expenditures		15,676.90
Balance (vouchers pending)		8.76

SUBSTATIONS

Stations	Debit	Credit
Total	$ 84,000.00	$ 84,000.00
Received from the State Treasurer	84,000.00	
No. 1, Beeville		4,499.27
2, Troup		4,000.00
3, Angleton		4,000.00
4, Beaumont		5,997.21
5, Temple		4,207.82
6, Denton		4,996.89
7, Spur		5,599.31
8, Lubbock		5,099.86
9, Balmorhea		4,498.70
10, Feeding and Breeding Station, College Station		6,888.23
Dairy section		998.95
Swine section		1,294.96
Poultry section		1,595.90
11, Nacogdoches		3,998.88
12, Chillicothe		3,186.42
14, Sonora		9,312.47
15, Weslaco		4,432.92
16, Iowa Park		9,012.23
Balance unexpended (vouchers pending)		379.98

SALES FUNDS

MAIN STATION TREASURY

Division	Debit	Credit
Total	$ 26,514.24	$ 26,514.24
Balance brought forward from previous year	6,744.34	
Received from sales during year	19,769.90	
Veterinary Science		2,117.89
Horticulture		418.40
Chemistry (Analysis Fund)		13,098.18
Entomology		12.25
State Apicultural Research Laboratory		142.10
Agronomy		50.99
Main Station Farm		3,024.12
Plant Pathology and Physiology		1,764.63
Farm and Ranch Economics		824.36
Photographic Laboratory		965.23
Interest and Discount		584.66
Transferred to Ten Per Cent Account		296.64
Balance		3,214.79

SUBSTATION TREASURY

Station	Debit	Credit
Total	$ 71,091.68	$ 71,091.68
Balance brought forward from previous year	8,089.02	
Received from sales during year	63,002.66	
No. 1, Beeville		2,757.77
2, Troup		517.15
3, Angelton		702.09
4, Beaumont		423.74
5, Temple		1,189.52
6 Denton		3,981.43
7, Spur		7,908.17
8, Lubbock		3,563.46
9, Balmorhea		2,282.11
10, Feeding and Breeding Station, College Station		3,679.93
Dairy section		9,170.87
Swine section		3,582.57
Poultry section		4,591.18
11, Nacogdoches		13.15
12, Chillicothe		1,322.97
14, Sonora		11,044.48
15, Weslaco		2,568.56
16, Iowa Park		1,524.59
Wool Scouring Plant		173.05
Soil Survey		1,496.78
Administration		1,360.01
Balance $7,534.74, less amount due Ten Per Cent Account $296.64		7,238.10

SULPHUR FUND

Item	Debit	Credit
Total	$ 3,916.21	$ 3,916.21
Balance brought forward from previous year	1,416.21	
Received from Freeport Sulphur Company of Freeport, Texas	2,500.00	
Disbursements:		
Salaries		1,085.00
Freight and express		60.92
Laboratory supplies		171.79
Balance		2,598.50

FEED CONTROL SERVICE

Item	Debit	Credit
Total	$101,574.22	$101,574.22
Receipts:		
Tax collected (inspection tax tags)	101,574.22	
Disbursements:		
Salaries		19,509.13
Labor		961.10
Postage, stationery, and office supplies		2,090.08
Freight and express		335.99
Travel expense		9,580.57
Furniture and fixtures		1,019.59
Tags bought		11,934.37
Refunded on redeemed tags		843.00
Repairs on buildings		81.93
Publications (annual bulletin)		2,301.08
Chemical analyses		12,000.00
NET SURPLUS		40,917.38

INVENTORY VALUATION

Grand Total Valuation of Properties Used by Agricultural Experiment Station System		$1,051,267.11
Owned by Station System and carried on Station Inventory	$911,817.42	
Owned by College proper and carried on College inventory, but used by Station System for Station purposes	139,449.69	

STATION SYSTEM PROPERTY

Total Inventory Valuation		$911,817.42
Main Station	$206,267.49	
Substations	705,549.93	

MAIN STATION

Total		$206,267.49
Administration	$ 40,154.98	
Veterinary Science	30,129.45	
Horticulture	19,712.12	
Chemistry	11,356.06	
Range Animal Husbandry	17,708.70	
Entomology	8,610.44	
State Apicultural Research Laboratory	14,867.14	
Agronomy	8,036.28	
Main Station Farm	32,472.90	
Plant Pathology and Physiology	7,084.50	
Soil Survey	961.10	
Farm and Ranch Economics	2,296.61	
Botany	1,540.11	
Publications	6,206.38	
Photographic Laboratory	2,714.97	
Feed Control Service	2,415.25	

SUBSTATIONS

Total		$705,549.93
No. 1, Beeville	$ 27,591.62	
2, Troup	35,461.35	
3, Angleton	20,493.74	
4, Beaumont	29,036.15	
5, Temple	29,187.95	
6, Denton	42,754.67	
7, Spur	57,636.40	
8, Lubbock	35,849.35	
9, Balmorhea	21,887.92	
10, Feeding and Breeding Station, College Station	65,840.84	
Dairy section	23,321.75	
Swine section	9,873.49	
Poultry section	11,072.80	
11, Nacogdoches	24,751.19	
12, Chillicothe	26,008.42	
14, Sonora	128,074.46	
15, Weslaco	89,531.00	
16, Iowa Park	27,176.83	

PUBLICATIONS AVAILABLE

Order by NUMBER

BULLETINS

No.
128 Cottonseed Meal as a Human Food (Technical)—1910.
159 Steer Feeding—1913.
162 Composition and Digestibility of the Chloroform Extract of Texas Hays and Fodders (Technical)—1913.
163 Digestion Experiments on Men with Cottonseed Meal—1913.
165 Ammonia-Soluble Inorganic Soil Colloids—1914.
166 Digestion Experiments with Texas Feeding Stuffs—1914.
167 Commercial Fertilizers and Their Use—1914.
169 The Total Fatty Acids and Other Ether-Soluble Constituents of Feedstuffs—1914.
170 Texas Feeding Stuffs; Their Composition and Utilization—1914.
171 Losses of Moisture and Plant Food by Percolation—1914.
172 Sudan Grass—1915.
173 The Composition of the Soils of the Texas Panhandle—1915.
174 The Effect of Organic Compounds in Pot Experiments—1915.
175 Distribution and Digestibility of the Pentosans of Feeds—1915.
178 The Effect of the Additions on Availability of Soil Phosphates—1915.
181 Oxidation of Organic Compounds in the Soil—1915.
182 Steer Feeding—1912.
183 Moisture Relations of Some Texas Soils—1915.
184 Cooperative Fertilizer Experiments with Corn—1908-14.
185 The Production Co-Efficients of Feeds (Technical)—1916.
186 Fattening Lambs—1916.
187 Sprays and Spraying—1916.
188 Tile Drainage—1916.
189 The Composition of Cottonseed Meal and Cottonseed—1916.
190 The Effects of Additions on the Availability of Soil Potash and the Perparation of Sugar Humus—1916.
191 The Composition of Rice and Its By-Products—1916.
192 Soils of Grayson, Lee, McLennan, Titus and Tyler Counties—1916.
195 Japanese Sugar Cane as a Forage Crop—1916.
196 Digestibility of Sugar, Starches, and Pentosans of Roughages—1916.
197 Progress Report, Substation No. 3, Angleton, Texas—1909-14.
200 Progress Report, Substation No. 4, Beaumont, Texas—1909-14.
201 Peanut Meal and Ground Whole Peanuts for Hogs—1916.
203 The Productive Values of Some Texas Feeding Stuffs—1916.
204 The Recurving of Milo and some Factors Influencing It. (Technical)—1917.
207 Poultry Houses and Poultry Equipment for Texas—1917.
208 The Fig in Texas—1917.
209 Progress Report, Substation No. 2, Troup, Texas—1909-14.
210 Barns for Work Animals—1917.
211 Field Experiments with Crown Gall—1913-17.
212 The Availability of Phosphoric Acid in Rock Phosphate—1917.
213 The Composition of the Soils of South Central Texas—1917.
214 Progress Report, Substation No. 1, Beeville, Texas—1910-14.
215 Progress Report, Substation No. 5, Temple, Texas—1910-14.
218 Progress Report, Substation No. 7, Spur, Texas—1909-14.
219 Progress Report, Substation No. 8, Lubbock, Texas—1910-14.
221 Progress Report Substation No. 9, Pecos, Texas—1910-14.
222 The Composition of Peanuts and Peanut By-Products—1917.
224 The Influence of Peanuts and Rice Bran on the Quality of Pork—1918.
226 Cooperative Soft Pork Investigations—1918.
227 Studies of the Harlequin Bug—1918.
228 The Influence of Peanut Meal on the Quality of Pork—1918.
229 Experiments at Substation No. 3, Angleton, Texas—1909-16.
231 The Beemoth or Waxworm—1918.
232 Mineral Requirements of Sheep—1918.
236 Grain Sorghum Improvement—1918.
240 The Utilization of Yucca for the Maintenance of Cattle—1918.
243 The Need of Texas Soils for Lime—1919.
244 Composition of the Soils of Archer, Franklin and Harrison Counties—1919.
245 Feeding Values of Certain Feeding Stuffs—1919.
247 The Chemical Composition of the Cotton Plant—1919.
255 Beekeeping for Beginners.
258 Report of Experiments at Substation No. 4, Beaumont, Texas—1915-18.
259 Nitrification in Texas Soils (Technical)—1920.
262 The Searing Iron vs. the Knife for Docking or Detailing Lambs—1920.
263 Rations for Fattening Steers—1920.
269 Grain Sorghum vs. Corn for Fattening Lambs—1920.
270 A Study of the Black and Yellow Molds of Ear Corn—1920.
277 Sweet Potato Fertilizer Experiments at Substation No. 2—1921.
279 Type and Variability in Kafir (Technical)—1921.
282 Composition and Feeding Value of Wheat By-Products—1921.
285 Beekeeping for Beginners.
292 The Blueweed and Its Eradication.

295 Correlation Between External Body Characters and Annual Egg Production in White Leghorn Fowls.
296 Grain Sorghum vs. Corn for Fattening Baby Beeves—1922.
305 Swine Feeding Experiments—1923.
307 Texas Root Rot of Cotton and Methods of Its Control—1923.
308 The Sweet Potato Weevil—1923.
309 I. Fattening Steers on Cottonseed Hulls With and Without Corn.—II. The Influence of Age on Fattening Steers—1923.
310 The Interpretation of Correlation Data—1923.
311 The Influence of Individuality, Age and Season Upon the Weights of Fleeces Produced by Range Sheep—1923.
312 Commercial Fertilizers in 1922-23.
325 Effect of Cropping Upon the Active Potash of the Soil.
326 Breeding Experiments with Blackberries and Raspberries.
313 Rice Bran and Rice Polish for Growing and Fattening Pigs—1923.
314 Commercial Feeding Stuffs, Sept. 1, 1922 to Aug. 31, 1923.
315 Digestion Experiments with Oat By-Products and other Feeds, Report No. 7—1924.
316 The Soils of Brazos, Camp, Ellis and Washington Counties—1924.
317 Comparative Influences of Various Protein Feeds on Laying Hens—1914.
318 The Relation Between Rents and Agricultural Land Values in Theory and in Practice—1924.
319 Field and Laboratory Notes on a Fatal Disease of Cattle Occurring on the Costal Plains of Texas (Loin Disease)—1914.
320 The Influence of Individuality, Age and Season upon the Weights of Fleeces Produced by Angora Goats under Range Conditions—1924.
321 Cotton Variety Experiments at the Main Station—1912 to 1922.
322 Commercial Fertilizers in 1923 and 1924.
323 The Price of Feed Utilities.
325 Effect of Cropping Upon the Active Potash of the Soil.
326 Breeding Experiments with Blackberries and Raspberries.
327 An Agricultural Economic Survey of Rockwall County Texas.
329 Energy Production Coefficients of American Feeding Stuffs.
330 Farm Mortgage Financing in Texas.
332 Biometrical Studies of Lint and Seed Characters in Cotton.
333 Heritable Chlorophyll Deficiencies in Seedling Cotton.
335 Commercial Fertilizers in 1924-25.

CIRCULARS

1 Strawberries Under Irrigation in South Texas—1914.
7 Insect Enemies of Sudan Grass—1915.
10 Housing Farm Implements—1915.
22 The Malvaceous Plants of Texas—1920.
26 Cost of Production; Its Relation to Price—1920.
30 The Practicability of the Milking Machine—1923.
31 Standard Fertilizers and Their Use (Reprint)—1923.
32 Cotton Boll Weevil Control in Texas—1924.
33 Texas Agricultural Experiment Station System—1924.
34 The Lower Rio Grande Valley of Texas.
35 Suggestions on Queen Rearing.
36 Foulbrood Control and Diseases of Bees—Foulbrood Law and Revised Regulations.

ANNUAL REPORTS

25th for 1912; 26th for 1913; 27th for 1914; 28th for 1915; 29th for 1916; 32nd for 1919; 35th for 1922; and 36th for 1923.

Address all communications to

B. YOUNGBLOOD, Director,

College Station, Texas.

Agricultural Experiment Station,

Agricultural and Mechanical College of Texas.